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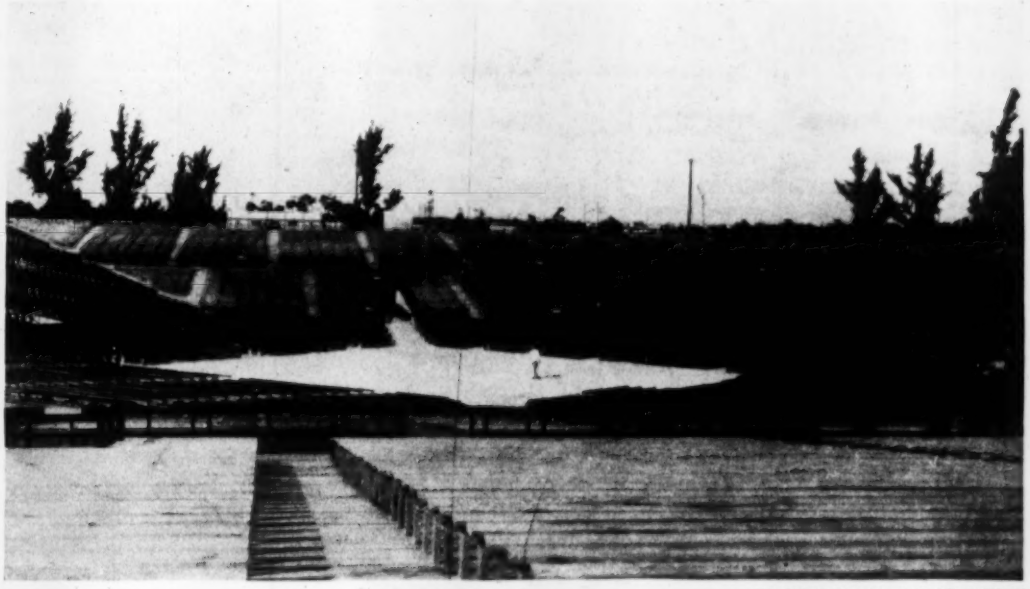

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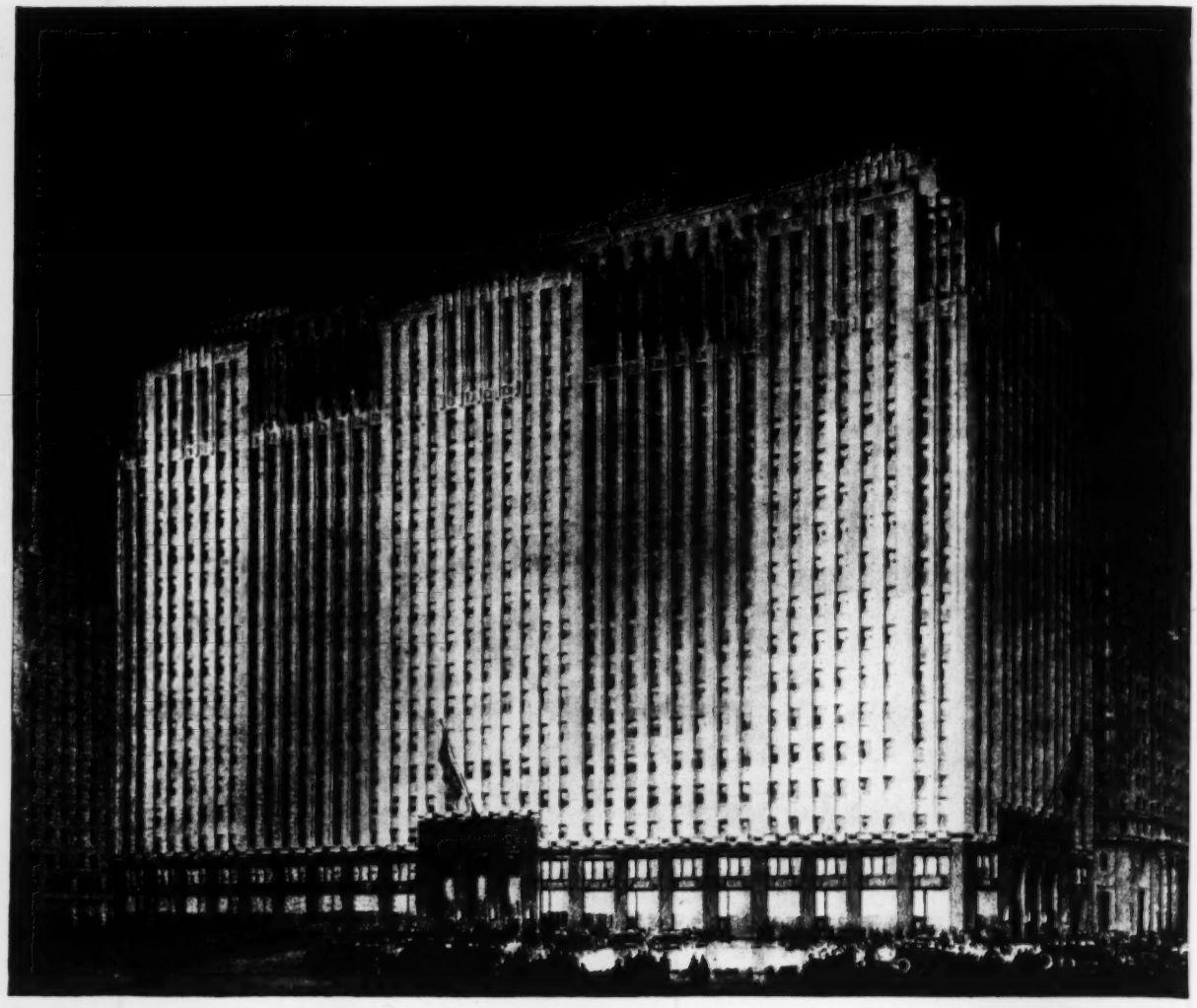
Santa Fe Railroad Builds New Line to Mexico
Asphaltic Concrete on Caliche Sub-Base for Texas Roads
Methods of Financing Sewerage Systems
Supplying Water to a Large Memorial Fountain

Report of Steel Construction Convention



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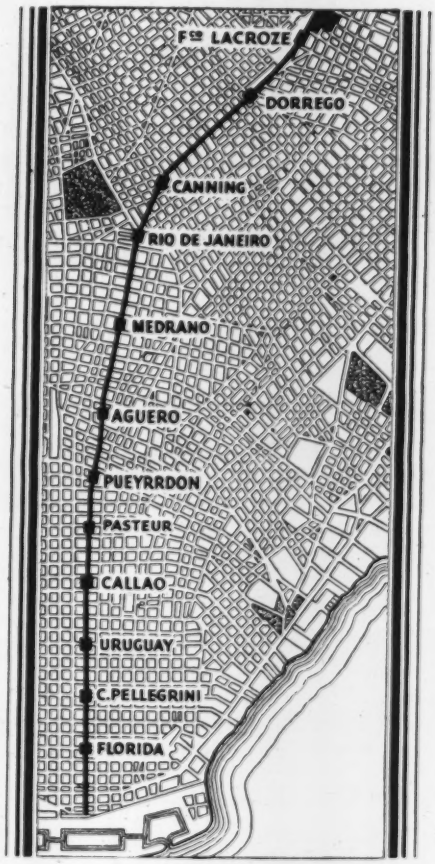

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, NOVEMBER 6, 1930 Number 19

Successful Association Work

CONSTRUCTIVE development work by a regional organization is brilliantly exemplified in the activities of the Associated Pennsylvania Constructors, which society has recently celebrated its ten-year anniversary. Within the decade this organization has piled up a fund of accomplishment in credit stabilization, accident prevention and promotion of prequalification that is a credit to the industry of which it is a vital element. Greater than this, even, is the fact that its sincere and constructive willingness to co-operate has earned for it the privilege of being called as consultant and co-worker to the public works officials and legislators in every movement undertaken in the interests of state or municipal construction. In both policies and practices the association gives practical help. In all of this work a very large measure of credit is due to persons who have freely applied their individual abilities and judgment in driving forward the association's work. As in every strong organization strength has come from creative personalities.

The Right Approach

EQUALLY constructive work is done in the field of national trade associations by the American Institute of Steel Construction. Conventions of that organization are of a nature to appeal to the profession and are not narrowed to its commercial problems of the moment. Such a program was presented at last week's meeting, and it invites commendation. Conventions, however, are incidental happenings in the life of an association or society. Whether or not the annual convention is successful is not a criterion of the usefulness and success of the organization. The routine work throughout the year is what counts and is the proper yardstick for measuring accomplishment. It is in its everyday work that the American Institute of Steel Construction sets an example. Its accomplishments include a standard specification for structural steel, a code of standard practice to protect and conserve the rights of both the buyer and seller of structural steel, an artistic bridge design competition among architectural and engineering students, an annual award of recognition for the most artistic bridge built during each year, the development of a design for a steel floor for buildings and bridges and the carrying out of an extensive research program to fit this floor for safe use, and even more promising research on wind stresses and welding. The broad character and usefulness of such activities are apparent. At this year's convention new activities were planned, among them the development of a standard specification for highway bridges, the sponsoring of a design competition for better construction in the residence field, and the appointment of a committee to lend its support to a movement to secure uniformity in laws relating to mechanics liens on public works. So long as the steel fabricators follow their present policy of studying the extension of the market for structural steel in the broad useful way now followed, they deserve universal co-operation.

Yes, Costs Are Low!

CONFIRMING the figures published by *Engineering News-Record* in recent weeks, official reports just obtained by the Division of Public Construction at Washington show that construction costs now are at an exceptionally low level. It is an excellent time to build, therefore. Especially the federal, state and local governments are now in a position to obtain improvement works at bargain prices. Typical examples of the reports of low costs are these: the supervising architect of the Treasury states that present building bids of a kind to permit comparison with prior bids average nearly 15 per cent below 1929, and as much as 20 per cent below on small structures; the largest decreases are east of the Mississippi. Engineer Corps figures on river and harbor construction range from zero to 44 per cent below comparable figures of a year ago. Road-construction contracts, the Bureau of Public Roads finds, are in some cases 10 to 15 per cent below any bids of recent years, in spite of the fact that wage rates have been well sustained. All the data, in short, point to economies of real magnitude that may be realized by putting work under contract now. Even a considerable anticipation of coming demands may be ventured to advantage, it is clear, for the savings shown will overbalance a substantial interest charge on construction that could be deferred for a time. Costs are indeed low. Some courage may be needed to decide on taking advantage of them; but profit rarely comes without courage.

City Oil Gushers

THE WILD oil well whose actions threatened life and damaged property in Oklahoma City last week has been curbed by the ingenuity of drillers and is safely under control. The neighbors can now return to their oil-smeared homes and wait until the next drill bit sets off another potential disaster. The situation in Oklahoma City plainly shows that oil prospecting and urban development are not compatible. It raises the question of the propriety and perhaps of the legality of permitting drilling in proximity to settled communities. The difficulties which arise in every oil field over the rights of adjacent property owners are increased many times in a city where plots are small. Signal Hill in California encountered the problem and a high-class residential section was abandoned to the oil drillers. That the capital city of Oklahoma is greedy enough for the wealth and prestige that a producing field brings to consider similar action seems improbable. An oil field at the back door may mean prosperity. On the other hand it may result in ruin. The city council doubtless would not permit a magazine of high explosives to be

placed in the city; but an oil well tapping a gas supply of 100 million feet daily capacity is a comparable hazard. Oil well development when pushed into urban centers takes on some resemblance to the famous irresistible force meeting the immovable object. Something has to give way. Sooner or later some very original and intensive thought must be focused on this situation.

Fighting Earthquakes

NEWS of more earthquake destruction came from Italy this week. It brings to mind the campaign procedure which that country has followed for some years past in fighting earthquake destruction. Italy applies the only effective method known, namely building houses and other structures strong enough to resist the shocks. Under the program established in Italy the national government virtually takes upon itself the burden of rebuilding what an earthquake has thrown down; it pays two-thirds of the rebuilding cost, provided this amount does not exceed the value of the structure destroyed. But at the same time it imposes on the country a rigid specification for earthquake-resistant construction, and requires this type of construction to be adopted for all new building in certain areas, grouped in two classes according to estimated degree of hazard. In the design of structures in the first zone, horizontal forces are to be taken at one-eighth to one-sixth the vertical load, depending upon the part of the structure being considered, from ground to roof respectively. For structures in the second zone somewhat lower amounts are prescribed. Reinforced-concrete framing is most generally applied. Roof thrust must be eliminated, bonding and anchorage provided, and foundations tied together by girder or mat construction. Such regulation is commendable, and invites consideration of its value for application in other regions that suffer occasional earthquake disturbance. Until that distant time when, if ever, we shall have learned to prevent or control earthquakes, our chance for safety lies in resisting their effect by strong building.

A Peculiar Case

A SITUATION entirely out of the ordinary in contract procedure and of genuine interest to engineers, contractors and municipal administrators has developed as to the liability for the loss of a steel highway bridge span at Garland City, Ark., by dynamiting (reported in *Engineering News-Record*, Sept. 11, 1930, p. 431). The contract under which the structure was built provides that the contractor shall be liable for any and all damage to the work from any cause whatsoever arising from the execution or non-execution of the work until its completion and acceptance by the state highway commission. Apparently the bridge was ready for acceptance Sept. 1; all employees except the superintendent had left the job and all equipment and materials had been shipped out. The consulting engineer happened to be out of the state at the time of completion, so was asked to make final inspection and acceptance Sept. 5. But on Sept. 3 the center span was dropped into the river by an explosion set off by persons of unknown identity. The contractor is now replacing the damaged span under an agreement with the state that such replacement in no way implies the contractor's liability. Which party is liable for the loss? As far as we know there is no precedent to the case. To all intents and purposes the structure was completed and awaiting formal acceptance by the state, and as far as he was concerned the contractor had completed his work. Yet a strict interpretation of the contract wording holds him liable for any damage until the work is actually accepted. As the Arkansas state constitution provides that the state shall never be a party defendant in any action in the state courts, the contractor is at the mercy of the legislature in presenting a claim. Obviously it will be a hardship on the contractor to stand the full loss; yet it is equally a hardship on the people of the state to pay twice for a part of the work. Regardless of the outcome of this case, it does demonstrate the need of some manner of taking care of such extraordinary situations with justice to all concerned.

Progressive Thinking

REPORTS of new thinking in the West concerning the safety of dams betoken a healthy state of mind. Few structures present as concentrated a menace to human security as do dams, and since engineers are answerable for the stability of these structures they have proper reason to assure and reassure themselves on the subject. It is not enough to believe that a dam was safe when built; we must also know confidently that it has remained safe, without harm from slow-working deterioration. It is true that the record of experience shows dams to be highly enduring, capable as a class of resisting the attacks of time almost perfectly; but in view of the peculiar menace of the hazard, general experience is insufficient to guarantee a particular dam. For this reason frequent scrutiny supported by continuous observation of behavior is eminently proper. Fortunately, such attention to dam maintenance has become a more effectively recognized necessity in recent years than in our earlier history. Another change that has come about in the course of time is lessened faith in the idea that calculation will make a dam safe. The history of dam construction went through a distinctly mathematical era, and in that time the engineer's attention was turned so largely to the superstructure—what we ordinarily think of as the dam itself—that the substructure was neglected. Today the unity of superstructure and substructure is better appreciated, and because of the often dominating importance of the substructure the engineer is coming to resist the temptation to indulge in refined mathematical analyses of superstructure elements. The line of advance is sound, and the trend toward restudy of dams and toward a preference for increased care, even for oversafe construction, seems adapted to hasten progress.

A Russian Record

COMING BACK from Russia, where the great hydro plant on the Dnieper in the southern Ukraine is under construction, Col. Hugh Cooper brings news of a remarkable performance record just made in that undertaking. During September and October, in sixty-one working days, the builders placed 266,000 cubic yards of concrete, a steady average of more than 4,300 yards per day. No prior concreting performance approaching this one comes to mind; in fact only two years ago one-half as great a rate of output, 67,000 yards in one month, was acclaimed as a great achievement in the building of Pardee Dam, and this year a placement of 113,000 yards a month a Bagnell Dam similarly took record position. To learn that the present much greater performance was accomplished in a remote region, primitive in its industrial and constructional development and commanding

neither a competent equipment industry nor a supply of skilled labor, is truly something worth thinking about. The greatest share of the credit for the performance, says Colonel Cooper, belongs to American machinery and equipment, which proved not merely good but superexcellent, to use his own words. Derricks, cranes, shovels and the rest performed with an efficiency and endurance that passed every reasonable expectation. So by this transfer of our mechanical power, coupled with similar transfer of engineering and managing skill, the United States in effect created the remarkable achievement—an achievement of even larger stature in view of the statement that the concrete placed in such huge volume is of quite exceptional quality, dense and watertight, all of it mixed 2½ minutes and placed by direct deposition with two-yard buckets. And nevertheless, the work is not fairly appraised unless its human element is given due recognition. Essential credit must go to the ability shown by the unskilled Russian workers, who had virtually never seen or handled mechanical devices before they came on this job and yet succeeded in using the great power tools effectively enough for special achievement in quality and continuity of operation.

Undoing the Gas Tax

PRESSURE for higher gasoline tax rates and wider division and diversion of gas-tax funds will be exerted on state legislatures when they meet this winter. If this exploitation of an excellent tax measure is not to become dangerous to highway development it has to be met by positive action.

Because the road-building and road-using industries have a thoroughly sound structure, the tax on motor-vehicle fuel early became one of the most popular special imposts in the history of tax legislation. It was originally dedicated to highway improvement, and appeared unusually equitable by reason of the fact that it measured road use very perfectly; therefore its vogue reached remarkable proportions in a few years. But the evil side of the picture is that legislatures found the public so amenable to the exaction of the gasoline tax that they soon grasped at it as a new device for taxation, offering escape from the normal opposition to assessments and general taxation. And so the gas tax was converted into a means for raising money for all public uses.

During the last twelve months the legislatures of twenty-one states have increased gasoline tax rates, and in most states the increased revenue was dispersed for local uses or diverted to other uses than road improvement. Gasoline taxes now help to finance schools, sea walls and fish hatcheries. In one state this week the people voted on bond issues for state institutions and internal waterways to be financed by an increase in gasoline taxes. Even greater departures from the original structure and purpose of the tax are being commonly spoken of. It is not too much to expect that many of them will appear as proposed acts in the forty-four legislatures which will meet this winter.

If the precedent of 1930 lawmaking is followed during the coming year, it will ultimately prove the undoing of the gasoline tax. State and federal public roads officials have in this hazard one of the most serious problems that confront the roadbuilding industry. Unless they proceed promptly and positively toward its solution, the continuance of road building on a scale commensurate with necessity will be in jeopardy.

Lessened Control of Water Power?

RECENTLY the Attorney-General put a definite check upon attempts to expand the jurisdiction of the Federal Power Commission to include power developments upon non-navigable streams. In a number of instances the commission has taken jurisdiction over such developments on the ground that the navigability of the lower reaches of the river might be adversely affected by the way in which the water in the upper reaches was manipulated for power purposes. Several states protested, with the outcome that the Federal Power Commission appealed to the Attorney-General for a ruling.

The Attorney-General states that the commission has no right to insert in the license any conditions (other than the 50-year limitation upon its life) which are not necessary to full utilization of the waters of the stream for navigation purposes. Heretofore the commission has included in such licenses all the conditions of the Federal Power Act applicable to projects on navigable waters. Its right to do so has long been questioned. Hence many states have hailed this decision as a signal victory for those who believe that the states rather than the federal government should exercise control over the financing, construction and operation of water-power plants.

This decision appears to have cleared up the situation in so far as power plants on non-navigable streams are concerned. It may also be found to have an important bearing upon the federal government's control over power plants on navigable streams. That also has been a subject of controversy between the federal government and some states, notably New York, where the federal government claims to have wide control over power development on the St. Lawrence River.

The Attorney-General's decision, stressing as it does the fact that the federal government's claim to the right of control on non-navigable streams arises solely from its right to regulate interstate commerce, immediately raises the question as to how control over non-navigable rivers differs from that exercised over the navigable ones. Dams which power companies build on navigable rivers obviously have a more definite effect upon shipping than do dams on the upper, non-navigable sections of the streams, and it is apparent that the federal government must have the right to say what locks, channels, and other aids to navigation must be built when navigable rivers are dammed. But what has the financing of these structures or the way in which the power companies who build them keep their accounts got to do with navigation? Nothing! How then, if the government may not step in and dictate as to the financing of power developments on non-navigable rivers, can it step in and dictate as to the financing of those built where the rivers are open to shipping? The conclusion seems inescapable that it cannot. If its rights upstream are limited to the effect of dams on navigation alone they must be similarly limited in the navigable sections.

Herein lies the wider importance of the Attorney-General's ruling. Already it has assured to the states greater control over the power developments upon their non-navigable streams. If carrier to its logical conclusion it may restore to the states similar control over power on their navigable rivers. Clearly this strikes at the very heart of our present system of federal water-power regulation. Until the questions which the Attorney-General's decision has raised are answered, regulation, both state and federal, is bound to remain chaotic.

Structures for Public Assemblages

A Group of Articles Describing Means by Which Designers Have Met Special Problems of Seating, Space Utilization and Economy in Three Stadiums and an Auditorium

As the number of people desiring to see athletic contests, to view exhibits of machinery, materials and products of industry and to hear concerts and addresses of various kinds increases, the ingenuity of the engineer who undertakes to provide adequate housing and seating facilities is taxed more and more. By and large, each project is a special one and must be attacked by the designer as such. However, certain individual operations, methods or plans in a project often have a wide application, so that descriptions of specialized jobs are important and worthwhile. The four articles presented below are no exception to this rule. To cite only a few typical instances, the stage and proscenium walls of the New Orleans auditorium are movable; the area beneath the seats in the Birmingham high school stadium is utilized for classrooms; the shape of the Miami stadium may be changed to suit the type of athletic contest, and the structure itself exemplifies sturdy construction details in timber; building a concrete stadium for $6.60 a seat, as was done in Sacramento, Calif., is unusual, if the costs of $9 to $15 given in Hool's text on reinforced-concrete design may be taken as representative. The latter figure, $15 a seat, was the cost of the University of California stadium, which seats 80,000, and was considered low for structures of that type. By presenting four articles in the same issue, the reader is enabled to compare the various specialized arrangements and construction details and to weigh them most effectively for his own use and information.—Editor.

Stadium Houses Classrooms

Special Framing Arrangement and a Watertight Deck Permits Steel Structure for Birmingham High School to Serve Dual Purpose

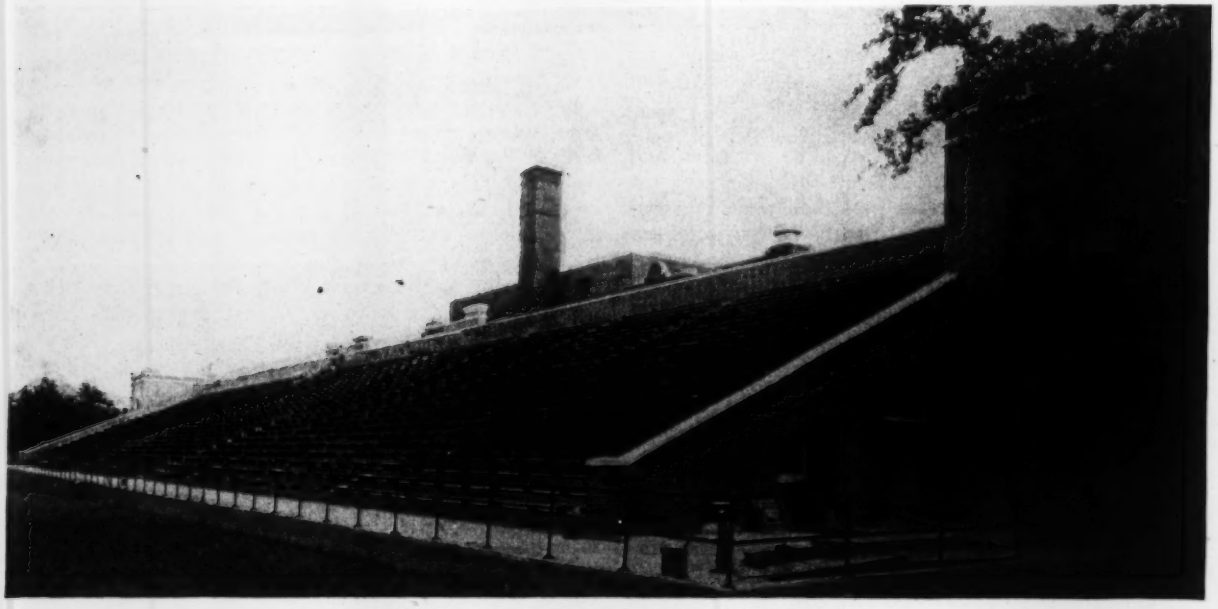
By W. N. Woodbury

Division Engineer, Virginia Bridge & Iron Co., Birmingham, Ala.

A structural steel stadium, using the watertight steel deck as a roof for eight classrooms, an auditorium, two small armories, corridors, washrooms and storage spaces, has recently been completed for the Woodlawn High School in Birmingham, Ala. The athletic field of this school is directly in the rear of the main building, and the new stadium is built parallel to the rear of the building at a distance of approximately 30 ft. A brick and stone finish on the stadium harmonizes with the school building. The length of the stadium proper is 300 ft., corresponding to the length between goal lines of the football field and also to the length of the school building. At each end of the stadium are two entrance towers easily accesible for the handling of crowds from the main thoroughfares. Also, near the center of the stadium there are two entrances, one on each side of the auditorium and connecting with the corridors that serve the classrooms. These entrances also connect with small ramps extending to the front of the stadium. Stairways from the entrance hall serve the armories over the classrooms.

The Birmingham board of education required several additional classrooms as well as a football stadium for this school. It was therefore decided to combine the two needs in one structure and also to make provision for a small auditorium, the present large auditorium in the school building being inadequate to supply all of the various needs. Military drill is a part of the curriculum of the school, and it was important also to provide rooms to store rifles and other equipment.

The deck consists of ¼-in. plates, bent to form the seat



COMBINED HIGH SCHOOL BUILDING AND STADIUM

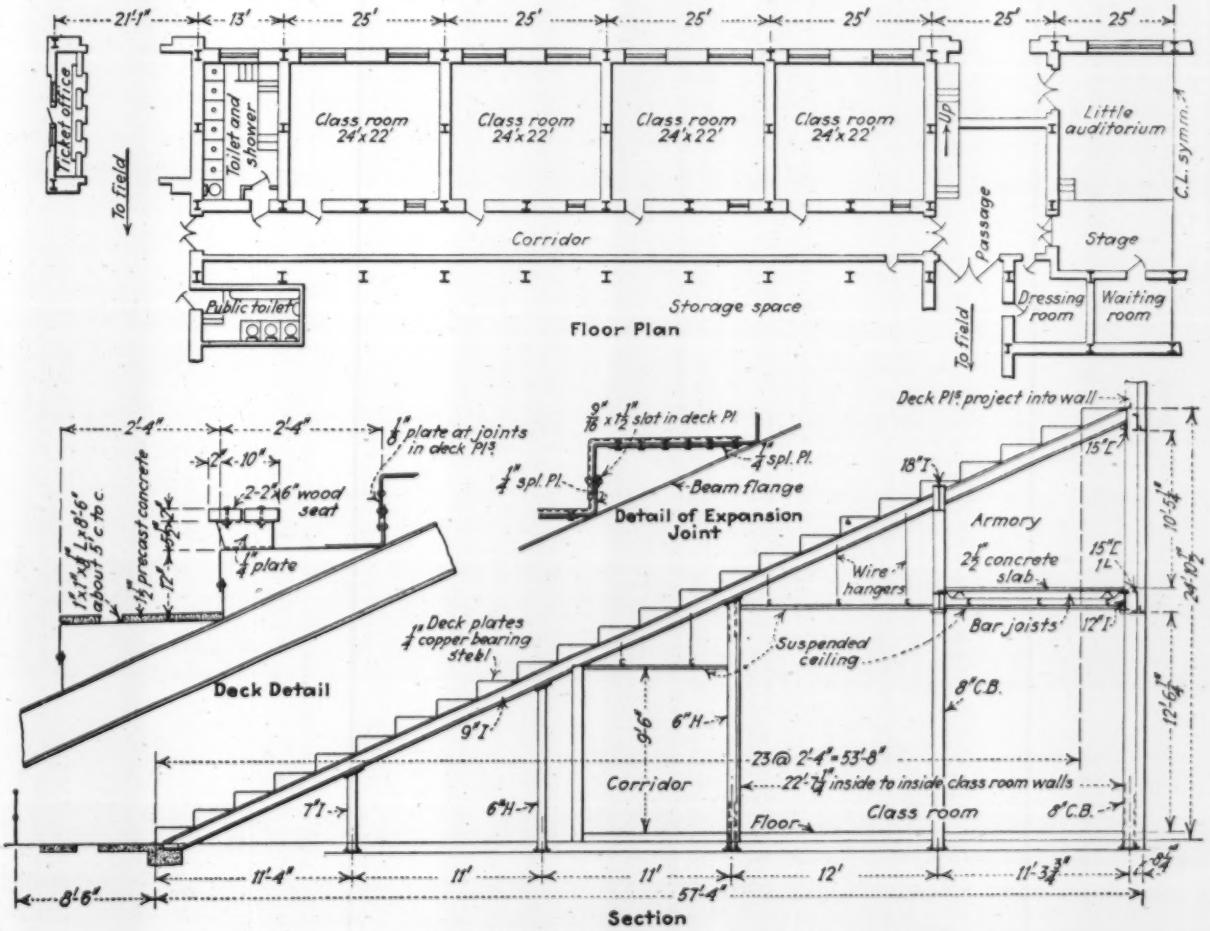
Structural steel framing is inclosed with brick and terra cotta to harmonize with existing building, the top of which is visible behind stadium parapet.

and riser in one piece with lap-riveted joints at the center of the riser. This is a patented design of Prof. B. J. Lambert, of the University of Iowa, and has been used in various structures during the past few years. There are five transverse column spaces in the width of 57 ft. 4 in. The structural supports for the steel deck consist of I-beams resting on the steel columns, which are spaced on 12½-ft. centers for the length of the stadium, except for the two lines of taller columns at the rear of the stadium, for which the column spacing is 25 ft.; beams are framed between the columns to carry the seat supports. This gives a clear area of 22x24 ft. for the classrooms. For the portion of the steel structure over the auditorium, 26-in. longitudinal I-beams are used on a span of 37½ ft., making the clear area of the auditorium 37x36 ft. Above the rear half of the classrooms the armories, 11x110 ft. in plan, are carried on bar-joist concrete floors, supported by longitudinal steel beams. The towers, at each end of the stadium are of steel-frame construction with bar joists supporting the floor and roof. The lower parts of the towers are used for entrance gates and ticket offices, and the upper story of the towers comprises the dressing rooms for the teams. An unusual feature of the team dressing rooms is that the entire football field can be seen from the windows.

CLASSROOM SIDE OF STAND

The stadium provides 4,208 seats, allowing a width of 18 in. and a depth of 28 in. The seating area is served by aisles at intervals of approximately 25 ft. The rise for the seats being 12½ in., intermediate steps are provided in the aisles, consisting of a steel support, on which is placed a 1½-in. precast concrete slab, reinforced with galvanized steel mesh. These same slabs are used for the walking space behind the seats, being placed directly on top of the steel with the back of the slab against the steel risers and the front of the slab held in place with small angles welded to the steel plate at convenient intervals. The purpose of the precast concrete slab is to prevent wear on the steel plates and reduce the maintenance charges. Hot asphalt was placed on the steel where the slabs rested, and the joints between slabs were filled with plastic cement. Careful attention was given to elimination of pockets that would hold water. The seats are made of two widths of tidewater cypress, bolted to steel supports which are welded in turn to the steel deck. The steel deck has a slight slope for drainage, but the seat brackets are sloped in the opposite direction so as to make a more comfortable seat.

In constructing the steel frame the seat plates were bent in 12½-ft. lengths equal to the spacing of the steel supports. Butt splice plates were provided over each



STRUCTURAL DETAILS OF COMBINED SCHOOL BUILDING AND STADIUM

joint, arranged so as to lap just below the seam where the seat plates lap. These were riveted to the seat plates and afterward welded where necessary to make the deck watertight. Two expansion joints are provided in the length of 300 ft., consisting of a plate extending over the joint and bent down between two small angles welded to the seat plates, these joints being filled with plastic cement to provide a water seal. Both at the rear walls and at the end walls of the stadium the seat plates are bent up into the brick wall to prevent any possibility of seepage. The entire steel deck was tested with a fire hose at high pressure and all incidental leaks stopped with electric welding. Every possible precaution was taken to make the structure permanent, and all exposed steelwork on the deck is made of copper-bearing steel.

The walls of the stadium, supported on concrete footings and on the steel frame, are made of brick with hollow tile backing. Interior partitions are of hollow tile. Two lines of steel sash in the rear walls provide ample lighting. The upper line of windows in the entrance halls provides excellent ventilation, producing a noticeable draft from the classrooms and corridors along the line of the sloping ceiling to these windows. Furred ceilings are supported from the steel deck over all rooms except in the armories, where the steel deck is exposed.

In calculating cost the respective elements of the structure are separated by allowing for the classrooms, auditorium and armories a figure corresponding to their average cost in other schools of the city. On this basis the stadium proper involves a cost of less than $6 per seat.

The general design was made by the Birmingham board of education, C. B. Glenn, superintendent of schools and V. J. Douglas, supervisor of manual training. All main contract work was performed by day labor under the construction department of the board of education. The structural steel frame was designed, fabricated and erected by the Virginia Bridge & Iron Co., Roanoke, Va., the design being made under the supervision of the writer and the fabrication performed at the compnay's Birmingham plant.

* * *

A Timber Stadium at Miami

Unit Construction Permits Alteration From Octagon Shape for Fights to U-Shape for Football—Cost $2.50 per Seat

By Jacob Feld and Lionel K. Levy
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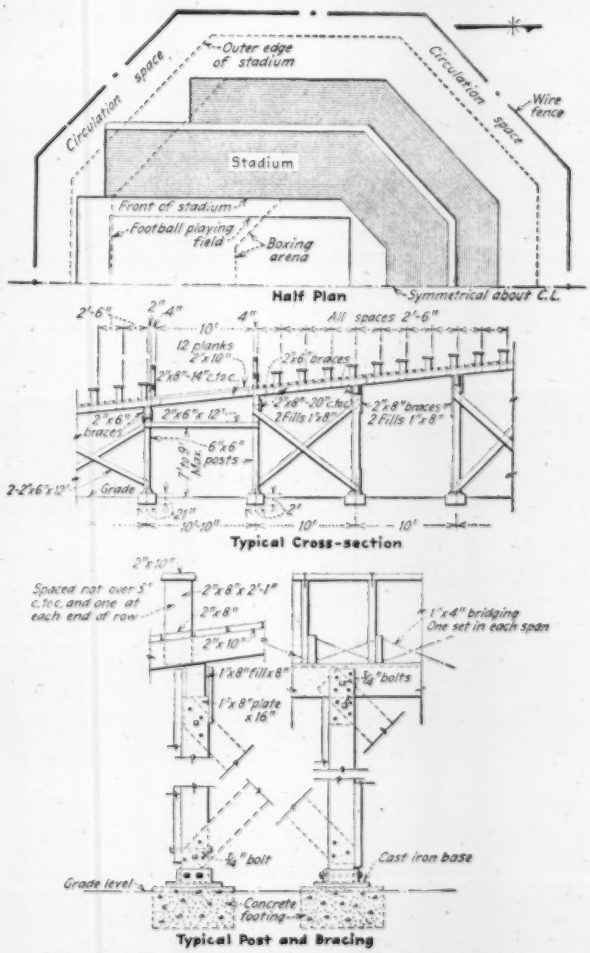
SIMPLICITY of design and the reduction of field labor by virtue of completely developed details were responsible for the rapid construction of the Madison Square Garden Arena at Miami, Fla., a timber grandstand for 50,000 people, built at a cost of approximately $2.50 per seat, including plumbing and electrical work. The problem was to construct a football field and suitable stand for seating about 30,000 people and then, with the minimum possible wastage, to complete the stand for a prizefight, adding 20,000 seats, after removing two temporary wings. Timber was used, since the stand would be useful during only a small part of any year. Concrete footings were utilized to reduce ravage by rot and ants. All timber was longleaf yellow pine.

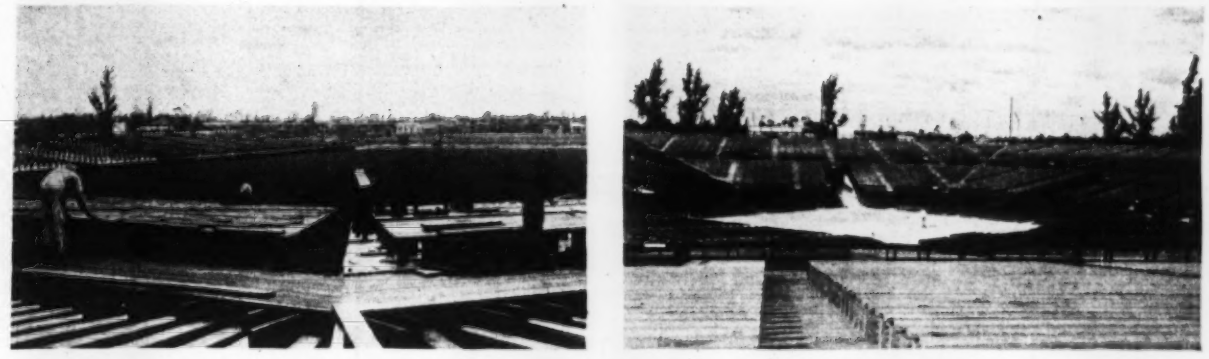
The structure was used for two football games and several fights last year, but will probably remain in its octagonal shape for fights only this year. Preliminary plans were started late in August, 1929, construction drawings were completed Sept. 24, construction started on Oct. 10, and the field and first stand were ready for football two months later, in spite of unusually bad weather. Football games were played on Nov. 25 and Dec. 14, and the first prizefight was held on Feb. 6, 1930.

In designing the stand, seat rows were spaced 30 in. apart on a deck with a constant slope of 1 to 10. The plan of the stand is octagonal, 560 ft. 10 in. between parallel sides, with a central octagon 200 ft. wide for the arena. The deck has 67 seat rows and is divided into eight units by radial lines. Seats, rows, aisles and structural supports are identical for each unit, except that the bracing of posts was of two systems because of the location of concession stands in alternate units. The first stand for football consisted of five units (built 50 rows wide) and two temporary units flanking the field. These temporary units were on timber mud sills and were later re-used for the completion of the main stand. The accompanying illustration indicates how the structure can be changed from octagon to U-shape, with the use of the same units.

Each unit has three exits, a vomitory 10 ft. wide from the field level and two stairs, 9 ft. in the clear, from an



DETAILS OF TIMBER GRANDSTAND, MIAMI MADISON SQUARE GARDEN



MIAMI MADISON SQUARE GARDEN AS A FOOTBALL STADIUM AND AS A PRIZEFIGHT ARENA

intermediate cross-aisle level. Additional ringside seats were constructed within the main stand, using the vomitories for exits. After the main fight, about 35,000 people left the stand an 3½ minutes, actual measured time.

An allowance of 18 in. was made for each seat, or a total area of 54 sq.in. per person, without allowance for aisles. A live load of 80 lb. per square foot was chosen, corresponding to 300 lb. per seat. Unit stresses were taken as 1,200 lb. per square inch in flexure and 150 lb. per square inch in shear. All joists and beams lapping over supports were designed for a moment factor of $\frac{1}{10}$. Details of the construction are shown in the accompanying plan. Beams are 6x10 in. throughout, 10 ft. long, spanning 9 ft. 4 in., allowing for a half-joint at the posts. Posts are 6x6 in. for the lower half of the stand, up to a net height of 10 ft., and 8x8 in. for the rest up to a maximum height of 18 ft. 9 in. The three highest lines of posts are braced at the mid-height, the rest of the stand is braced two ways in tower fashion, two diagonals in each alternate span.

Each connection contains at least one bolt to prevent excessive shrinkage with its accompanying loosening of the spikes. Joists lap over beam supports and beams are fish-plate connected to posts, except where bracing plates are used for gussets. The bottom of posts are set on 1-in. steel dowels set 6 in. into the concrete footings and into the posts. In addition, every second post is bolted to a 2x½-in. strap anchored into the footing, as a hurricane tie. Along the radial lines between units, joists are made double so that each unit of the deck is independent.

All material was ordered cut to length, and placing lists were prepared in connection with construction drawings. All exposed seats, floor and railing timber were given two coats of paint, all other faces were sprayed with creosote. Timbers were all bench cut with a gasoline-driven saw; holes were bored in place with power drills. All labor was local, a maximum of 130 men being employed at one time. The total lumber required was 1,350 thousand board-feet.

Fire protection consists of 24 hose reels, and required carrying an 8-in. main for 1,600 ft. to connect to city supply. Electrical work required was unusually large and included carrying a power line 1,500 ft. to the site, three 50-kw. transformers, floodlights for the arena and for the fight ring. All transformers were inclosed in reinforced-concrete vaults. Operation of all lights is from a special observation seat with pushbutton remote control.

The general arena required thirty-two 1,000-watt floodlights on sixteen posts located around the exterior of the stand. The lights were placed 32 ft. above the high point of the deck. The ring had forty 1,000-watt floodlights. The exterior of the stand was lighted by 300-watt lamps with reflectors, hung about 30 ft. apart.

All rooms and passages underneath the deck are inclosed with corrugated iron. The exterior of the stand is protected with corrugated iron 10 ft. high, with a wire fence 50 ft. from the stand. Entrance through the fence is by means of sixteen controlled gates, 26 ticket sellers being located near these gates. There are, in addition, 24 exits.

The stand was planned for the Madison Square Garden Corp. by Leon & Lionel Levy, architects, in New York, with Jacob Feld as designing engineer. Lionel Levy supervised construction for the owners.

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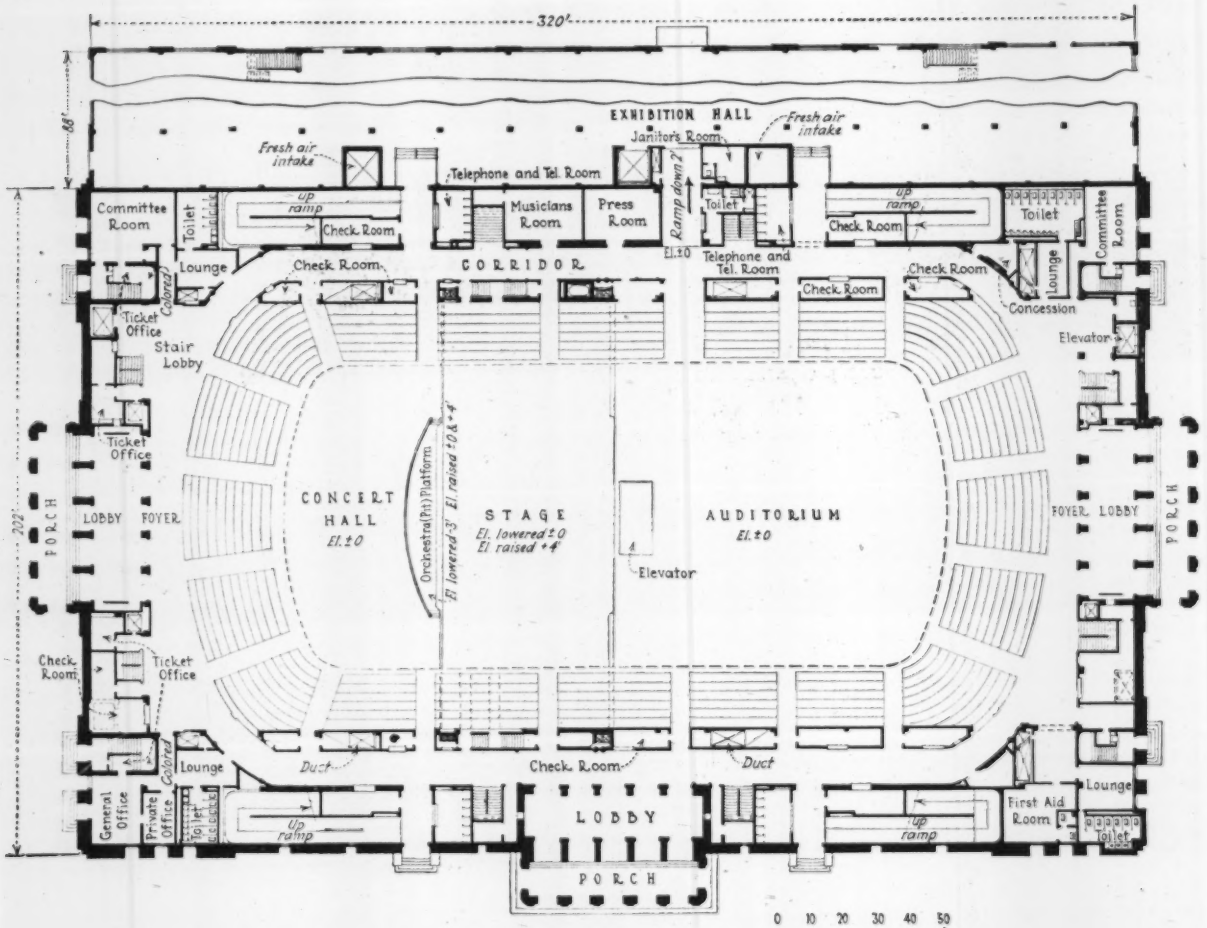
Municipal Auditorium at New Orleans

Large Exhibition Space and Seats for 10,000 Persons—Movable Stage and Proscenium Walls Permit Combining Auditorium and Concert Halls

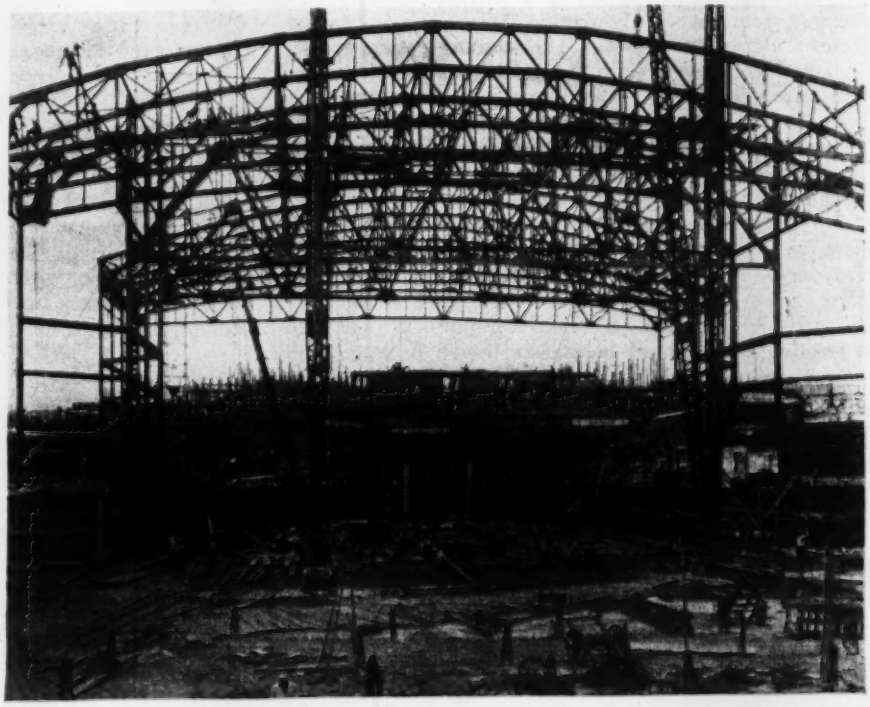
THE MUNICIPAL auditorium completed recently in New Orleans, designed to accommodate a large variety of public performances and exhibitions, presented several unusual architectural and structural problems. Financed by a municipal bond issue at a cost of approximately $2,000,000, it is planned for conventions requiring extensive display space and seating capacities ranging from a few hundred to 10,000. Included in the structure are an exhibit hall, a concert hall and an auditorium.

NEW MUNICIPAL AUDITORIUM AT NEW ORLEANS
Penthouse on top houses stage machinery.



FIRST-FLOOR PLAN OF NEW ORLEANS MUNICIPAL AUDITORIUM

The exhibition building is of warehouse type, 88x320 ft., while the concert hall and auditorium cover an area 202x320 ft. The latter are separated, as shown in the plan, but can be converted into a single bowl by changing the position of the stage, orchestra pit and proscenium walls, which are movable. The auditorium, with main floor and sloped balcony of reinforced concrete, is roofed with crescent-shaped steel trusses 15 ft. deep at the center, spanning 199 ft. 10 in. from wall to wall. The steel wall columns are incased in concrete and laterally supported by the concrete structure. The trusses were assembled and riveted on the floor and raised as a unit. The supporting columns, which had an l/r ratio of 325 before the balcony was installed, were steadied by guys during the erection of the



DERRICKS LIFTING ROOF TRUSSES OF 200-FT. SPAN IN NEW ORLEANS MUNICIPAL AUDITORIUM

trusses. The concert hall involves similar construction, with concrete balcony extending 29 ft. out from the supports and with roof trusses of 165-ft. span. The balcony rises from the second level (+ 13½ ft. above the main floor) to the fifth level at El.+ 43, the organ floor. The top of the proscenium arch is at El.+ 40.

Quick-hardening portland cement was employed to expedite the construction of the superstructure, and forms were removed when test cylinders indicated a strength of 80 per cent of the required 3,000 lb. per square inch. This necessary strength was obtained in six to ten days. The structure was completed in ten months from the time the contract was awarded.

The architects were Favrot & Livaudais, Ltd., of New Orleans. The structural design was made by the architect's engineer, Paul D. Cook. General contractors were Caldwell Brothers and Bond Brothers, and the structural steel was furnished and erected by the Lukens Steel Co., of New Orleans.

* * *

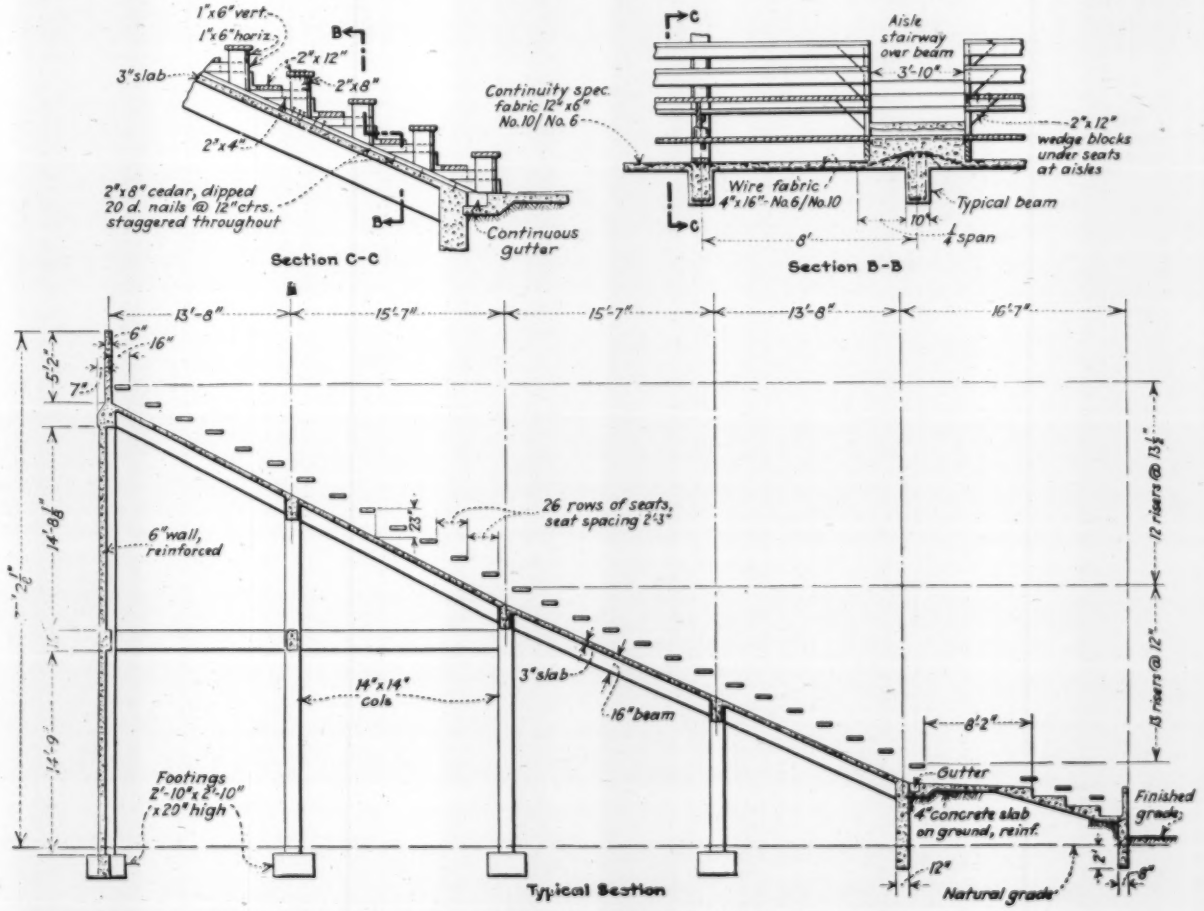
Concrete Stadium for $6.60 Per Seat

Plank Seats and Walk Boards Carry All Live Load to Concrete Beams 8 Ft. Apart—Slab 3 In. Thick Aids in Cleanup

DESIGNING a concrete stadium for the Sacramento Junior College at Sacramento, Calif., because of limited funds, presented the problem of working out plans which would cost much less to build than would the average stadium built above groundlevel as a concrete structure. By developing a structural arrangement of notably simple form, employing a design structurally independent of a floorslab and using timber seats and walkways that could be put in place with a minimum of labor, the cost for the 22,000-seat structure was kept down to $145,000, or $6.60 per seat. Costs for other features not included in the stadium proper—that is, grading and surfacing the field, building roads, fences, etc.—brought the grand total for the project up to $175,000.

The part of the structure built at the outset and in which the 22,000 seats are included is U-shaped in plan; later the open end may be closed with a semicircle duplicating the one already built into the closed end. The inner curve of the closed end has a radius of 157 ft., this curve making a complete semicircle to join the two sides, which are each 324 ft. long. The concrete structure has a total height of 37 ft., and the base width of the structural section is 52¾ ft. The structural section includes 26 tiers of seats supported above ground level; there are also three tiers supported on an earthfill at the toe of the slope.

Spectators enter the stadium through doorways 64 ft. apart and about 4 ft. above field level on a concrete paved aisle 7 ft. wide. From this level, stairway aisles 32 ft. apart lead up into the structure. Other than the walkboards which provide a footrest for each bench, there are no transverse aisles between the stairways. The stairways were located so that they are supported directly



SECTION AND STRUCTURAL DETAILS, SACRAMENTO JUNIOR COLLEGE STADIUM

on the inclined beams, thus doing away with the need for any floorslab to carry live load. On the outside of the structure a concrete wall 6 in. thick extends for the full height, thus inclosing the space beneath the tiers of seats.

The structural scheme consists essentially of concrete columns 14 in. square spaced 16 ft. apart both ways. The tops of these columns are connected by reinforced-concrete girders carrying one intermediate beam each way, which reduces the spans to 8 ft. With this short span a 2x12-in. plank is ample for carrying the maximum calculated load of 100 lb. per linear foot. Planks of this size were therefore used both for seats and for walkboards, the seat board being stiffened by a 1x6-edge board, as shown in the accompanying illustration, thus completing the essentials of a very simple design that could be erected with a minimum labor cost.

The columns were poured first from a portable concrete-mixing plant, moving along the outside of the structure. Later the concreting equipment again moved over the same route, pouring the beams and, monolithically with the beams, the 3-in. slab which it was decided to use as a cover and stiffener between beams. The 3-in. slab is not expected to carry any live load. In fact, it became impossible to stand on this cover slab after the timber seats and walkways were put in. However, the slab is strong enough to carry a live load of 37 lb. per square foot, which would take care of any construction loads, etc. This slab constitutes a stiffener for the column supports and provides a deck which can be hosed down after the stadium has been used, thus greatly facilitating the usual clean-up operations.

The 3-in. deck slab is reinforced with the usual wire mesh raised over the beams and dropped in the middle of each span, as shown in the illustration. This mesh is 4x16-in. size, with No. 6 longitudinal and No. 10 transverse wires. A novel feature of the steel in the slab is the continuity reinforcing extending as a band 5 ft. wide over each inclined beam, as shown in the slab section. This reinforcing, put on after the usual mesh was in place, was laid in the desired position by hoisting the roll to the top of the structure and, with one end fastened there, allowing the strip to unroll down the slope. The mesh size is 12x6 in. and the wires are No. 10 longitudinal and No. 6 transverse to the strip. Thus the transverse wire, which in this mesh is much the heavier of the two, gives the desired continuity feature over the top of the supporting beam.

It was recognized that this deckslab would be almost certain to crack here and there because of temperature stresses, but it was considered cheaper to provide separate roofs for the relatively small amount of space beneath the seats that was inclosed for dressing rooms than to make the slab itself watertight. Thus only two expansion joints were provided, one at each junction of curved and straight portions of the structure, and no outlay for watertightness was made other than the usual precautions in securing a dense and properly compacted mix. The concrete requirements call for a strength of 2,000 lb. in 28 days.

The first twelve rows of seats in the concrete structure are on a slope of 1 vertical to $2\frac{1}{4}$ horizontal, and the upper fourteen rows have a slope of 1 vertical to 2 horizontal.

The construction plan included placing 2x8-in. dipped cedar sills having twenty-penny spikes on their under sides driven partly into the timber, thus providing nail heads projecting downward into the concrete. The bottoms of these 2x8's were set flush with the surface of the deck, and to their upper surface were nailed the timbers constituting the seats and walkways. With this arrangement there is a space of $2\frac{1}{2}$ to 3 in. under the plank walkway, thus providing adequate clearance above the deck for sluicing down the refuse ordinarily discarded by the throngs that occupy the stadium during exhibitions.

The stadium was designed by C. H. Snyder, consulting structural engineer, San Francisco. Dean & Dean, Sacramento, were the architects. The contract was carried out by George D. Hudnut, Inc., contractor, Sacramento.

Solving Rectangular Concrete Members Subjected to Bending and Direct Stress

By L. C. Maugh

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THE problem of designing rectangular reinforced-concrete sections that are subjected to bending and direct stress will be more frequently encountered in the future because of the use of rigid frames. Therefore, a method of solution that involves only the ordinary terms and formulas should be of interest to designers. The method that is presented here seems to meet these requirements, since the numerical operations are made in the same sequence as for ordinary beams. The writer has checked the method with those given in most standard textbooks and believes that it is more direct and that the chances of numerical mistakes are less.

The analysis of concrete sections, subjected to both bending and direct stresses that cause tension over part of the member, has been considered frequently for the case of symmetrical reinforcement. When the steel is placed unsymmetrically the ordinary methods and diagrams are difficult to use and usually not directly applicable. In this analysis, which applies to any arrangement of reinforcement, only the properties of the section as used for ordinary beams and an auxiliary diagram are required. The concrete is assumed to resist no tension and to have a constant modulus of elasticity. The following terms, in addition to those indicated in Fig. 1, will be used in the solution:

A = Area of transformed concrete section that is effective for flexure only (shown shaded in Fig. 1).
I = Moment of inertia of A about neutral axis for flexure only.
I' = Moment of inertia of the entire effective cross-section about the true neutral axis.
Q' = Statical moment of the entire effective cross-section about the true neutral axis.
N = Normal force acting on the section.

If the plane section is assumed to remain straight after bending, the distribution of the unit stress over the section will be given by the straight line in Fig. 1 (b). The unit stress f at any fiber will be proportional to y, the distance from the true neutral axis—that is $f/y = C$, a constant.

Then for equilibrium,

$$N = \int f dA = f/y \int y dA = CQ'$$

also, $Ne = \int fdAy = f/y \int y^2 dA = CI'$

Solving these equations for e gives $e = I'/Q'$

From Fig. 1 it can be seen that

$$I' = I + Ag^2 + \frac{bg^3}{3}$$

$$\text{And } Q' = Ag + \frac{bg^2}{2}$$

$$\text{Or } e = x + g = \frac{I + Ag^2 + \frac{bg^3}{3}}{Ag + \frac{bg^2}{2}}$$

$$\text{From which } \left(\frac{bg^3}{6}\right) + \left(\frac{bx}{2} g^2\right) + (Axg) = I$$

Multiplying by $\frac{6}{bx^3}$,

$$\left(\frac{g}{x}\right)^3 + 3\left(\frac{g}{x}\right)^2 + \left(\frac{6A}{bx}\right)\left(\frac{g}{x}\right) = \frac{6I}{bx^3}$$

$$\text{Let } \frac{6A}{bx} = C_1 \text{ and } \frac{6I}{bx3} = C_2$$

which gives the final form of the equation as:

$$\left(\frac{g}{x}\right)^3 + 3\left(\frac{g}{x}\right)^2 + C_1\left(\frac{g}{x}\right) = C_2$$

The value of g/x can be obtained from the diagram, Fig. 2, for known values of C_1 and C_2. Such diagrams can be quickly drawn since C_1 and C_2 have a straight-line variation for any given value of g/x.

The method of solution involves the following numerical operations:

(*a*) Determine the value of kd, A, and I as if the section were subjected to flexure only.

(*b*) Determine the value of x from the direct force and bending moment and compute the value of C_1 and C_2.

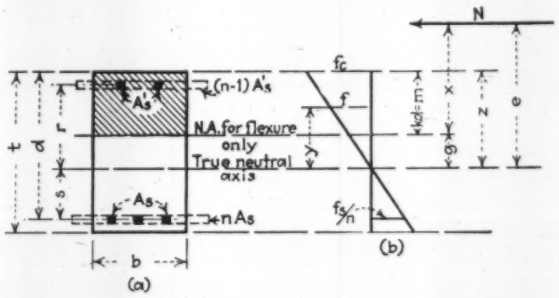


FIG. 1—NOMENCLATURE FOR SOLVING A CONCRETE BEAM SUBJECTED TO BENDING AND DIRECT STRESS

Crosshatched area effective for flexure only. N is a force acting x distance from the neutral axis for flexure only. Diagram in (*b*) shows the straight-line distribution of stress over the beam section.

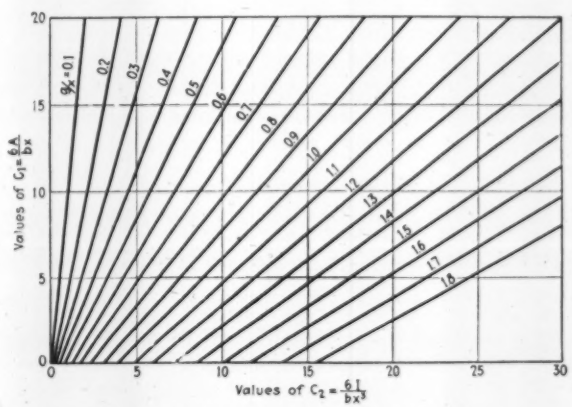


FIG. 2—DIAGRAM FOR VALUES of g/x

(*c*) Obtain g from the values of g/x in the diagram.

(*d*) Compute $I' = I + Ag^2 + \frac{bg^3}{3}$

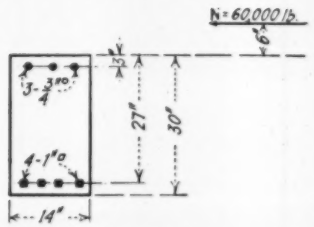


FIG. 3—CONCRETE BEAM SUBJECTED TO A 60,000-LB. FORCE 6 IN. ABOVE COMPRESSION FACE

(*e*) Then $f_c = \frac{Nez}{I'}$, where $e = x + g$ and $z = kd + g$.

Example

Compute the unit stress in the steel and concrete for the section shown in Fig. 3 for a force of 60,000 lb. that acts 6 in. above the top. $\frac{E_s}{E_c} = n = 15$

Transformed area of compression steel is

$$A_s' = (2.36)\ (14) = 33.04 \text{ sq.in.}$$

Transformed area of tension steel is

$$A_s = (4.0)\ (15) = 60.00 \text{ sq.in.}$$

Let $kd = m$. Then by taking moments of the area A about the neutral axis for flexure only,

$$(14m)\ (m/2) + 33.04\ (m-3) = 60\ (27-m)$$

from which $m = 10.38$ in.

$$A = (14)\ (10.38) + 33.04 + 60.0 = 238.36 \text{ sq.in.}$$

$$I = \frac{(14)\ (10.38)^3}{3} + (33.04)\ (7.38)^2 + (60)\ (16.62)^2 = 23{,}600 \text{ in.}^4$$

$$x = 10.38 + 6 = 16.38 \text{ in.}$$

$$C_1 = \frac{(6)\ (238.4)}{(14)\ (16.38)} = 6.24 \qquad C_2 = \frac{6 \times 23{,}600}{(14)\ (16.38)^3} = 2.30$$

From the diagram $g/x = 0.32$

$$g = (0.32)\ (16.38) = 5.24 \text{ in.}$$

$$I' = 23{,}600 + (238.36)\ (5.24)^2 + \frac{(14)\ (5.24)^3}{3} = 30{,}815 \text{ in.}^4$$

$$f_c = \frac{(60{,}000)\ (21.62)\ (15.62)}{30{,}815} = 660 \text{ lb. per sq.in.}$$

$$f_s = \frac{(660)\ (11.38)\ (15)}{15.62} = 7{,}200 \text{ lb. per sq.in.}$$

The same method of procedure can be used for concrete members that are subjected to direct tension and bending. The equation then takes the form:

$$(g/x)^3 + 3(g/x)^2 - C_1(g/x) = -C_2$$

where C_1 and C_2 have the same meaning as before. A new diagram can then be drawn for various values of g/x and the solution made as for compression.

When the size of the concrete section and the allowable stresses are known or assumed, then a direct solution for the required areas of the tension and compression steel can be made by the following equations:

$$z = \frac{nf_c}{f_s + nf_c} d$$

From Fig. 1

$$A_s = \frac{\frac{Nz}{f_c}(e - r) + \frac{bz^2}{6}(3r - 2z)}{ns(r + s)}$$

$$A_s' = \frac{z}{(n-1)r}\left(\frac{N}{f_c} - \frac{bz}{2}\right) + \frac{ns}{(n-1)r} A_s$$

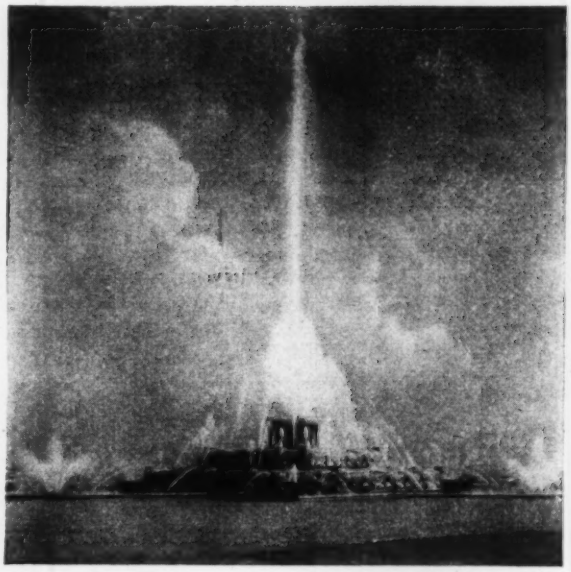
Supplying Water to a Large Memorial Fountain

Large Pumping Capacity Under 100-Ft. Head Provided by Independent Station—Jets Tested for Artistic Effects

By Charles B. Burdick
Of Alvord, Burdick & Howson, Engineers, Chicago

HYDRAULIC problems involved in the design of the water system for the Buckingham memorial fountain located on the waterfront of Chicago immediately opposite the business district of the city had mainly to do with the selection of a water-supply system of small-town proportions and a proper jet system to produce an artistic effect conceived by the architectural designer, with reasonable economy of capital expenditures and operating expenses. Although experimental data on the hydraulics of fire streams were of great use, the object to be obtained was different. The fire fighter desires to throw a given quantity of water to a given height in a solid and unbroken stream. The artistic demands of the fountain required the greatest show with the least expenditure of power. The quantity of water is unimportant so long as the proper effect is obtained.

The fountain comprises a shallow pool, about 280 ft. in diameter, containing a central effect of circular form, 103 ft. in diameter, rising with three cascades to a 23-ft. bowl, whose lip is 25 ft. above the outer pool. The central fountain includes a series of jets varying in height of throw to a maximum of 100 ft. Jets of lower height play from the surrounding pools, and eight surrounding fountain groups throw water in nearly horizontal direction. The falling water returns to the pool over the three central cascades. Night illumination in



BUCKINGHAM MEMORIAL FOUNTAIN CONSUMES A FLOW OF 22,000,000 GAL. PER DAY

five colors is supplied by projectors, some of them under water, and incandescent lights beneath the cascades. The jets are controlled in groups through hydraulic valves, and the lights are manipulated by switches and dimmers located with the valve-control cocks on an operating table in the underground pump house located close to the fountain, as shown in the accompanying plans.

Water Installation—The pump room, 35x25 ft. in plan and 11 ft. in height, is concealed underground at one corner of the pool. The roof is flush with the esplanade surrounding the pool, except for a small penthouse which projects 4 ft. above the level of the esplan-

HYDRAULIC TESTS OF NOZZLES FOR BUCKINGHAM MEMORIAL FOUNTAIN

Location	Jet No.	Nozzles Per Set	Nozzle Sketch — Plan	Nozzle Sketch — Enlarged Section	Orifice Size, In.	Total Area Orifice, Sq.In.	Foot Head at Nozzle	Vert. Height Above Nozzle	Horizontal Throw	Nozzle Coefficient	Gal. Per Minute Per Unit	Gal. Per Minute Per Set
Major Display												
Isolated group	1	4			1—1-$\frac{1}{4}$	0.995	42	30	0	0.643	105	420
Isolated group	2	16			5—$\frac{1}{2}$	1.53	23	12	0	0.92	165	2,620
Outer basin ring	3	12			1—$\frac{1}{2}$x2$\frac{1}{2}$	1.478	26	14	38	0.638	115	1,380
Lower basin ring	4	12			1—$\frac{1}{2}$x2-$\frac{1}{2}$	1.154	44	26	25	0.634	120	1,440
Intermediate basin ring	5	12			2—$\frac{1}{2}$x1$\frac{1}{2}$	1.143	47	30	14	0.634	125	1,500
Upper basin ring	6	12			1—1-$\frac{1}{4}$	0.995	57	35	0	0.65	120	1,440
Console	9	32			1—$\frac{1}{2}$	0.6	9	4	0	0.612	30	960
Sea horse	10	8			2—$\frac{1}{16}$x3	1.84	75	10	50	0.66	250	2,000
Upper basin central column	11	1			1—2$\frac{1}{2}$	4.92	135	80	0	0.735	.....	1,000
											Total.....	12,760
Minor Display												
Isolated group	1	4			As above	.....	30	20	0	0.643	30	120
Upper basin 2d ring	7	16			2$\frac{1}{2}$	1.2	11	6	0	0.92	90	1,440
Upper basin 3d ring	8	8	"	"	2$\frac{1}{2}$	1.2	16	8.5	0	0.92	115	920
Console	9	32			As above	.....	9	4.0	0	0.612	12.5	400
Sea horse	10	8			As above	.....	60	8.0	35	0.634	180	1,840
Upper basin central column	11	1			As above	.....	19	14.0	0	0.735	.....	380
											Total.....	5,100

ade. From the windows of this penthouse the operator can see the fountain when standing at the valve-control cocks and lighting switches.

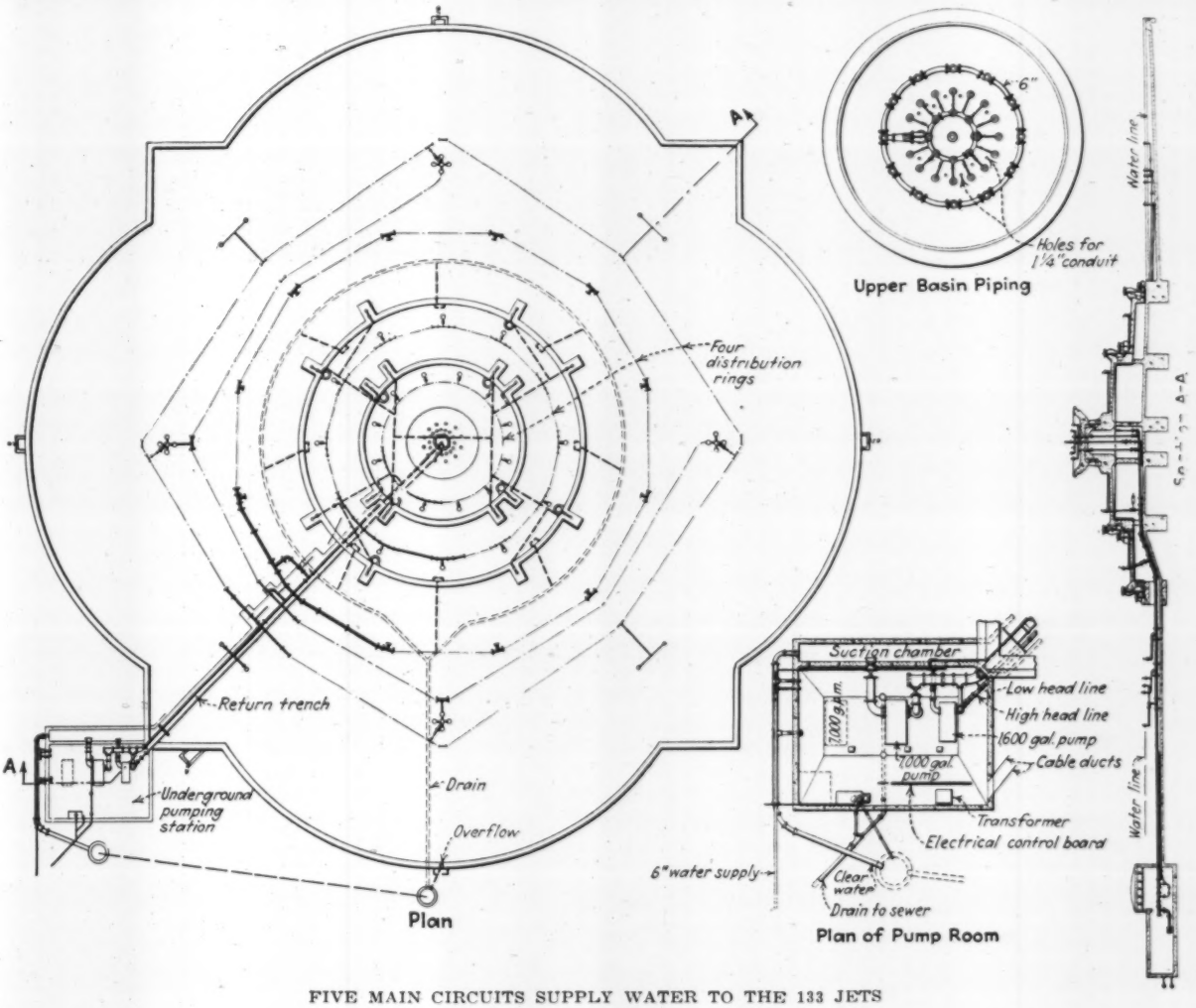
Water circulates from the pool through the pumps and through a system of pipes to the jets, thence down the cascades to the pool and back to the pumps. All pipes are concealed either under the water of the pool or under the central structure.

There are three pumps, two of 7,000 gal. per minute each and the third of 1,600-gal. capacity, all designed for 100-ft. head. They are driven by 250-, 190- and 75-hp. synchronous three-phase motors, respectively, supplied at 2,300 volts and direct-connected to single-stage centrifugal pumps. The head on the intake chamber is 7 ft. Two pressure mains, 20 and 8 in. in diameter, lead to the jets.

Two Displays—Although the hydraulic valves make a wide variety of water effects possible, only two effects are commonly employed. In the minor display one of the large pumps is used to deliver 5,000 gal. per minute. In the major display the total water thrown is 13,000 gal. per minute. In this display the two large pumps operate at 100-ft. head and the piping is so arranged that the small pump takes part of the water at this head and boosts it 100 ft. more to supply the central jet.

Jet System—Water is supplied to the 133 jets through five ring mains varying from 4 to 8 in. in diameter and a 6-in. pipe to the central jet. Each circuit is controlled independently. Excepting 48 of the smaller jets supplied by 1½-in. or 2-in. pipes, all jets regardless of height or capacity are supplied through short 3-in. branches. To assist in the cascade effect an 8-in. connection to the main header delivers water directly into the top basin through twelve 6-in. cock-controlled openings.

Preparatory to the design, experiments were conducted on openings and nozzles of various forms, including single circular openings of various sizes, groups of small circular openings arranged in ring form, narrow slots, and groups of narrow slots, annular openings and others. Pressure readings, pitot tube measurements of flow and photographs of the jets were studied before making final selections. It was thought that changes might be desirable after the fountain was placed in operation, and therefore the endeavor was made so to design the jets and their attachments that changes could be readily made. With this in view all supply pipes were terminated by a cock and flange on which any type of jet could be bolted. In the preliminary experiments on the fountain it was found that wooden caps upon these flanges suitably bored with an auger produced effects very similar to the more intricate forms of nozzle finally installed. Incidentally the experiments seem to check



FIVE MAIN CIRCUITS SUPPLY WATER TO THE 133 JETS

previous data on orifice flow, as the coefficient of discharge varied from 0.63 for an orifice with square edge to unity for a rounded orifice.

Light Display—Early in the study of the light display it was hoped that it would be possible to use light projected from outside as in the floodlighting of buildings, thus avoiding the complications involved by connections and lights submerged or flooded by falling water. Some study of experience elsewhere, however, satisfied the designers that the best effects could be secured by lights concealed in or under the water itself, close to the orifices, with beams projected upward along the jets, confining the illumination to the water. The adopted arrangement produces an effect like that of molten metal or liquid fire emerging from the jets, with no projection upon the background. Eighty-four 500-watt projectors illuminate the jets, and 560 75-watt incandescent lamps light the cascades.

With the approach of freezing weather the fountain basin, pipes and pumps are drained, and the lamps and motors are disconnected and stored for the winter.

DATA OF BUCKINGHAM FOUNTAIN

Owner, South Park Board; donated by Kate Buckingham in memory of a brother.

General Design by Bennett, Parsons & Frost, architects, Chicago.

Structural Design by L. E. Ritter, structural engineer, Chicago.

Hydraulic and Electric Design by Alford, Burdick & Howson, engineers, Chicago.

Construction by Dahl-Stedman Co., Chicago, C. W. Farrier, architects' superintendent; B. A. Wheeler, engineer's representative.

Material: Georgia marble on reinforced concrete.

Jets: 133, supplied under maximum head of 100 ft. by three centrifugal pumps of 7,000, 7,000 and 1,600 gal. per minute.

Pump Drive: three-phase synchronous motors, 60 cycle, 2,300 volts, of 250, 190 and 75 hp., direct-connected to pumps.

Water circulated from pool to jets and back to pumps; pumpage 5,000 gal. per minute for minor display; 13,000 gal. per minute for major display.

Five King Mains and pipe to central jet separately controlled by hydraulic valves; hand valve near each jet for adjustment.

Illumination: 84 kw., including 560 75-watt incandescent lamps and 84 500-watt projectors, grouped in 21 circuits, three-wire, with motor-operated dimmers. Indication by colored pilot lights.

Minnesota Highway Program Greater Than in Past Two Years

MINNESOTA will spend in excess of $15,000,000 this year for highway construction and maintenance in a program that includes 280 miles of paving and 400 miles of new grading. This year's expenditure will be more than 50 per cent greater than that of 1928 or 1929. About $4,500,000 will be spent for maintenance alone. By 1931 the state will have 1,500 miles of paved highway, or about half the 3,000 miles planned for the completion of the state highway system.

All of the revenue for the state highways comes from the 3c. gas tax, of which 1c. is distributed to the counties, motor vehicle license fees and federal aid. The state has no highway bond issues. The gas tax totals $10,000,000 annually, the vehicle licenses add another $10,500,000 and $2,100,000 is received as federal aid.

The standard paving slab on the state system is 20 ft. wide and 9-7-9 in. thick. Concrete proportioning is done by weight. Curing is usually done with earth and water where possible, though integral or surface calcium chloride curing is sometimes used. Beam tests are made ten days after pouring, and if the concrete tests satisfactorily, the road may be opened at the end of ten days. All aggregates are delivered by truck. Central mixing plants have not been considered, and no attempt has been made toward the use of truck mixers.

Western Engineers Giving Increased Study to Safety of Dams

California Is Making Survey of All Dams in the State—Foundations of Diablo Dam Carried to Unusual Depths

Special Correspondence

RECENT EVENTS in Western engineering give strong evidence of increased feelings of anxiety concerning the safety of dams. One of the notable developments is a survey of some 500 dams in California, which the state engineer began some time ago. This survey is being made in accordance with a law passed by the legislature after the failure of the St. Francis Dam in 1928, which failure awakened a great deal of public doubt and apprehension about the safety of such structures. The fact that the St. Francis Dam had stood and been in service for more than a year, and then failed, developed a fear that other dams which had been in service and which had been considered safe might also be in danger of failure.

Another item pointing toward the highly conservative attitude now prevailing in matters relating to dams developed in connection with the Diablo Dam. This structure, 100 miles east of Seattle, is built in a canyon where solid granite foundation was found on both sides as well as in the bottom, though here at some depth. Because the St. Francis failure occurred only a short time before this dam was built, the bottom excavation was carried a great deal deeper than had previously been thought necessary. A booklet describing the completion of the dam contains the following significant paragraph:

> Shortly after the stripping of the side walls was begun (at the Diablo site) the failure of the St. Francis Dam occurred. Instead, therefore, of stopping at a depth of approximately 12 ft. as had been planned, rock was excavated to a depth as great as 70 and 80 ft. in places to secure the greatest possible margin of safety for the structure.

In other words a large added expense was incurred not because it was considered necessary for a sound foundation but because extra assurance was sought that no possible question could be raised about the solidity of the structure's support.

Corresponding tendencies to conservatism are reflected elsewhere in current discussion about dams, both in engineering and in public circles. In some instances the term apprehensiveness would not be out of place in describing the frame of mind which prevails. It is well recognized that the investigations of the St. Francis failure revealed nothing to suggest changes in modern practice in building dams on solid rock foundation, for the poor quality of the material on which that structure rested was made evident by the subsequent inquiries and tests. However, the magnitude of the disaster directed universal attention to the importance of the highest possible degree of protection against similar failures.

Among the engineering questions which are receiving special attention in this period of conservatism or apprehension the principal one is uplift. Does the water pressure of a full reservoir produce an infiltration into the seams and pores of the rock which permits of building up enough pressure to decrease the stability of the dam? This question, though of acknowledged importance for decades past, is now being considered in a decidedly more active and practical manner.

Methods of Financing Sewerage Systems

Basic Principles Affecting the Raising of Money by Bonds, by Taxation, by Special Assessments and by Service Charges

By Harrison P. Eddy
Metcalf & Eddy, Engineers, Boston, Mass.

ENGINEERS, having sometimes been led to incorrect, or at least impracticable, propositions for financing public works, it is believed that a simple statement of the basic principles involved will be useful. While this article relates particularly to the financing of sewerage systems, the principles are general and, in so far as they are legally applicable, may be applied to the financing of public works of any kind.

Municipalities have four methods of raising money for the construction and operation of sewerage systems: by issuing bonds, by general taxation, by special assessments, and by charges for service. Still another method by which sewer construction is sometimes financed to a limited extent is through private enterprise, no public funds being used. This method should not be confused with sewerage systems built and operated by private companies, with which this article is not concerned.

Bonds—The construction of sewerage works of considerable magnitude usually involves a cost which cannot be met out of the taxes or other municipal revenues of a single year, and it is necessary, therefore, to borrow money in order to provide the necessary funds. Bonds are promises to pay definite sums of money at stipulated dates, together with interest (generally payable semi-annually) at a fixed rate. Three types of bonds have been used in municipal financing: those containing no definite provision for payment, and therefore likely to involve the issuance of a new set of bonds to refund the debt upon the maturity of the original bonds; those providing for the establishment of a sinking fund designed to accumulate sufficient funds to pay the bonds when due; and those providing for serial payments, so that some of the bonds mature and are paid each year until the whole issue is retired. A sinking fund is usually built up by annual installments, with their accumulations of interest compounded. If S is the amount of the debt, I the annual installment, r the rate of interest (written as a decimal) and n the term in years, and if interest is compounded annually, then $I = \frac{Sr}{(1 + r)^n - 1}$

The term of years for which municipal bonds may be issued is regulated by law in many states. It should never exceed the useful life of the works to be built from the proceeds of the bond issue. It is not considered good public policy to issue bonds for longer terms than about 40 years, even though the works to be built may last for centuries.

There is no difference in the relative economy of bonds of the several types, and of different terms of years, if a single rate of interest is applicable to all, and the same rate can be earned by sinking funds; nor is there any economic difference between paying cash in full and borrowing in perpetuity. However, the interest rate on sinking fund investments is frequently less than that paid on the bonds, and this difference may affect the relative costs.

Theoretically, the true basis for comparison of different plans of financing is the present worth of all the sums to be paid under each plan. For instance, if the rate of interest be 4 per cent, there is no economic difference between paying out $1,000 in cash or paying $40 per year for all time. Frequently it is argued that the total amount of money paid out in interest and capital payments is the significant consideration, and attention is called to the fact that a $100,000 serial bond issue at 4 per cent will involve total payments of $122,000 if it runs for 10 years; $142,000 if for 20 years; and $202,000 if for 50 years. Similar payments for a sinking fund bond (sinking fund earning 3½ per cent) will be $125,241, $150,722 and $207,309. While these statements are correct, they take no account of the present worth of future payments, and therefore the comparison is economically unsound. (The present worth P of a sum A to be paid at the end of n years is $P = \frac{A}{(1 + r)^n}$ r being the rate of interest which is to be compounded annually.)

There are certain advantages and disadvantages in the use of each type of bond. Experience has shown that officials have sometimes mismanaged or misused sinking funds, more often through incapacity than dishonesty; and in at least one state (Massachusetts) sinking fund bonds cannot now be issued by the state or any of its subdivisions. However, such bonds have the advantage of requiring a uniform payment throughout the life of the issue, while serial bonds generally require a high initial payment, decreasing as the bonds are retired. Since the relative ability of the municipality to pay is just the reverse of this, the serial bond imposes an unbalanced burden upon the community. However, as a matter of public policy there is serious objection to long terms for bonds and to the continuance of interest payments for many years. The relative burdens imposed upon the community in making payments of interest and in amortizing the debt, resulting from bonds of various types and various maturities, are of importance, but must be considered in the light of the restrictions imposed by state laws and by local ordinances.

Another consideration to which engineers frequently give but slight attention is the relative attractiveness to the investing public of bonds of various amounts, types, or lengths of life. In general, bonds of less than $1,000 denomination are not so readily salable and therefore are not looked upon by dealers with as much favor as those in "pieces" of $1,000. Bonds which have a considerable term to run are more attractive, in general, to investors than those maturing in the near future.

General Taxation—It is usually impracticable to raise by general taxation, in a single year, sufficient funds for the construction of major sewerage works, although the cost of minor extensions may be included in a tax levy. The money required for important works, as already noted, must usually be raised in the first instance by an issue of bonds. As a rule the money for paying interest on such bonds and the contributions to sinking funds or

payments of bonds maturing serially must be obtained partly or wholly from the proceeds of general taxation. Sometimes the proceeds of special assessments which are payable in installments are available to meet such payments. Usually the money required for operation and maintenance must be included in the tax levy.

Unless provision is made for raising at least a part of the funds required annually through special assessments or charges for service, or both, the requirements must be met entirely by general taxation. It is a common provision of law that, unless funds for bond interest and sinking funds or maturing bonds are provided from some other source, assessors shall include them in making up the tax levy.

Special Assessments—In many cases special assessments are made against property especially benefited by the construction of a sewer, to cover a part or all of the cost. Such special or benefit assessments can only be levied when the property so taxed is increased in value or otherwise benefited above and in addition to the general benefit accruing to the entire community, and the amount of the special assessment must not exceed the value of the benefit obtained.

In the case of lateral sewers a considerable proportion of the cost, often from one-third to three-fourths, is adopted as a proper benefit to be assessed against abutting property, the remainder being assumed by the community as a whole. In some cases an additional amount is assessed to include a small proportion of the cost of main sewers and of treatment works, since the lateral sewer could not actually benefit property without the main sewers and perhaps the treatment works which carry away and dispose of the sewage. Special assessments are frequently payable in installments over a term of years, commonly three or five years; and are usually collected in the same way as general taxes.

Several methods of computing the assessments have been used; the most common are based upon frontage, upon area, or upon a combination of frontage and area. Fixing the assessments upon the basis of frontage is the simplest to apply, but unless lots are of the same shape and size this may be distinctly inequitable. It is conceivable that an abutter might have a very small frontage upon the street but might maintain a large building upon a rear lot; and if he paid only on the basis of frontage he would pay much less than another owning a shallow lot with considerable frontage. Moreover, a corner lot might be assessed upon frontage on two streets, although the property might be fully served from one street. The latter objection is frequently met by exempting a certain frontage, such as 60 to 100 ft., from assessment on a second street.

Assessments based upon area alone are also likely to be inequitable, especially if lots are irregular. In any event, land lying more than 100 or 125 ft. back from the street may be benefited little by the sewer, and much distant land is usually exempt from the assessment.

In basing the assessments upon a combination of the frontage and area, the total sum which is to be assessed is divided into parts, as one-third to be assessed upon frontage and two-thirds to be assessed upon area. The net assessable frontage, after deducting exemptions, divided into the amount to be assessed upon frontage, gives the assessment rate per linear foot; and the net assessable area divided into the amount to be assessed upon area gives the assessment rate per square foot. The sum of the frontage and area assessment gives the total assessment for each lot.

In some cases the problem of equitably distributing special assessments is very complicated. Where a district under development includes much farming land not yet subdivided but nevertheless benefited by a sewer, it may be possible to compute the present worth of a future benefit so as to assess such farming land its reasonable proportion of the cost. (See "County Sewer District Work in Ohio and Assessments of Cost According to Benefits" by E. G. Bradbury: *Proc.* Am.Soc.C.E., September, 1928.)

Charges for Service—Until recent years charges for sewer service have not been common, but there is now a distinct tendency to make such charges. There can be no doubt of the propriety of annual charges for the use of sewers, sufficient at least to pay the costs of maintenance and operation, including the costs of treatment and disposal of the sewage. Where such charges are made they may well include a sum for "readiness to serve" which may be based upon the number and kind of fixtures connected; and another for use of the system, based upon the quantity of sewage discharged, as nearly as it is practicable to ascertain it. In general, the quantity of sewage may be taken as equivalent to the volume of water consumed.

The payment of charges for sewer service cannot be enforced by cutting off the sewer connection; this would be objectionable from the point of view of public health, and in many places it may be against the law. Therefore, it is important that there be laws, regulations, or contracts enabling the municipality to collect bills for such service. Where state laws permit making such charges by liens upon property, the collections may be made in the same way as taxes. In other cases it may be possible to collect bills for sewer service with those for water and to enforce their payment by cutting off the water service if necessary.

Private Financing—Sometimes it may be impossible to induce a municipality to construct sewers in newly developed streets, and in such cases the sewers may be constructed at the cost of the owner of the property. Occasionally such sewers are immediately donated to the municipality, the owners considering the cost as representing in effect a benefit assessment upon their land. Sometimes they remain private sewers for a time but are later purchased by the municipality or taken when the streets are accepted as public ways. When sewers, which are to discharge into the public sewers and will eventually form part of the municipal system, are constructed by private enterprise, they should be laid out by or subject to the approval of the city authorities, and should be constructed under the same specifications as sewers built by the city.

Building Cableway Over Port of Barcelona

Passenger transportation by means of an aerial cable will soon substitute a three-minute journey for one of 30 minutes between the city of Barcelona, Spain, and the neighboring beach of San Sebastián. The cable, which is now being installed, will be nearly a mile long and will cross the port at a height of 200 ft. so as not to interfere with shipping. Starting on Montjuich Mountain, which overlooks the city, it will pass over a 360-ft. tower situated near the docks and will terminate at a second tower 260 ft. high. Four cars, each with accommodations for 22 passengers, will be used. It is expected that the work, which will cost approximately $350,000, will be completed this year.

Asphaltic Concrete on Caliche Sub-Base for Texas Road

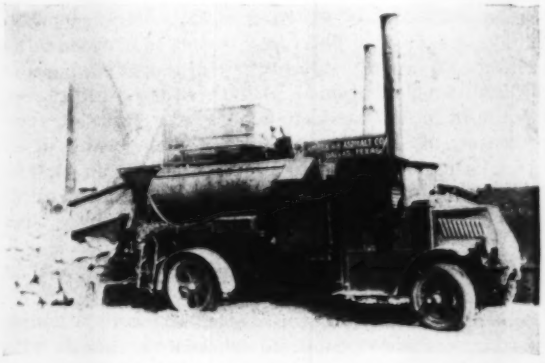
Local Caliche Beds and Limestone for Asphalt Aggregate Give Excellent Road-Surfacing Combination for Region Without Water

By J. E. Pirie
County Engineer, Shackelford County, Albany, Tex.

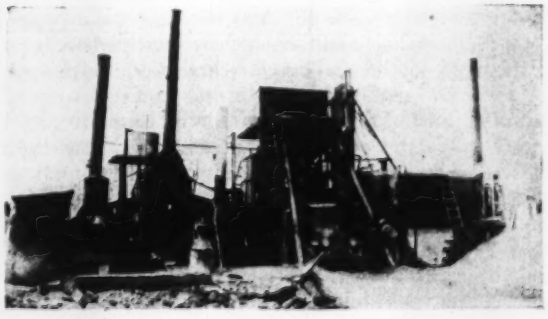
THE construction last year of 17.358 miles of road along the rough crest of Callahan Divide in Shackelford County, Texas, called for a type of surfacing that could be laid with the minimum amount of water, as there was no supply within reasonable distance of the project, which is situated in a semi-arid and thinly populated portion of west Texas. After thorough study it was decided to use a 6-in. compacted caliche sub-base, a 3½-in. compacted black base and a 2-in. compacted wearing surface of asphaltic concrete. This type of paving fitted the location admirably in that it made use of the maximum amount of local materials. The contract was let by the Texas state highway department in October, 1928, and work was begun Nov. 1, 1928.

Construction of Caliche Sub-Base

Throughout the territory traversed there exist numerous beds of caliche. The word caliche in the original Spanish or Castilian means the crust of lime that flakes from a wall, but now throughout the Southwest the term is used to designate the highly calcareous clay or impure limestone which forms the rim-rock or cap-rock of the high plains region. This substance, which has the setting-up property of limestone, exists locally in colors varying from white to brown and in grades varying from powder to fine gravel.



ASPHALT DISTRIBUTOR FILLING TANKS AT PLANT
The unusual practice was followed of locating the asphalt plant at roadside quarries and hauling the asphalt from the railway in distributor trucks provided with heat.



FIVE-BIN ASPHALT PLANT OPERATED BY OIL ENGINES
Truck taking on load of pavement mixture. Plant-mixed surfacing to 10:30 a.m. and black base for remainder of the day.

The specifications under which the contract was let called for a traffic-bound sub-base, as the scarcity of water would have made wetting and rolling unusually expensive. The material was loaded on trucks by a ¾-yd. steam shovel and hauled to the road, where it was spread upon a prepared sub-grade to a thickness of about 8 in. between form boards of 2x8-in. commercial lumber securely set with iron pins. When it was sufficiently damp to set up, traffic was allowed to compact it while continual blading and shaping brought it to the desired cross-section and crown. With the proper amount of moisture, traffic and maintenance, the caliche made a hard, smooth, well-shaped sub-base on which to place the asphaltic concrete.

Asphalt Paving Plant and Methods

The black base and wearing surface were built under the standard specifications of the Texas state highway department.

An unusual feature of the plant layout was the placing of the mixing plant at the rock quarries and the hauling of the asphalt from the railroad delivery points in an asphalt distributor, equipped to maintain heat and to pump the material into the plant storage tanks.

There existed two probable plant set-ups on the project, as there was a large supply of local limestone of good quality at two points along the highway. One site was at a point about 3 miles from the beginning of the project and the other at a point on the project about 4 miles from the end and 10 miles from the first probable set-up. The contractor decided to use both sites, completing 8 miles from the first set-up and 9 miles from the second.

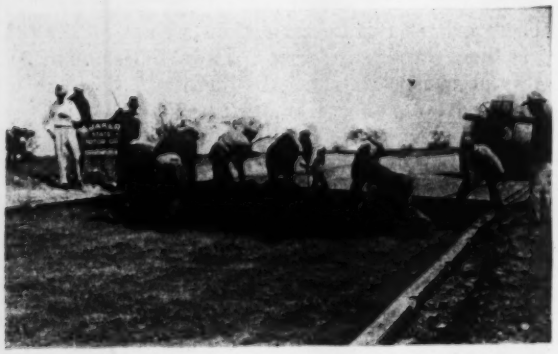
During the laying of the caliche base, crushing equipment for the asphaltic-concrete aggregate was set up and operations were begun. Part of the limestone used for crushing was in ledges, but the majority of the stone used was field stone. The cap of the Callahan Divide is crowned with flat slabs and boulders of hard limestone. This stone was quarried, broken into crusher size and placed in piles of about 2 cu.yd. each by Mexican laborers working under contract and paid by the cubic yard. The hillsides covered with these piles of rock resembled fields of grain in the shock.

As it was needed at the crushers, a crew of loaders and a fleet of small trucks brought in the stone. In spite of the fact that hand labor in its crudest form was used, there were few delays due to failure of the supply of stone, and the crusher was able to maintain its lead over the paving plant.

A five-bin bitulithic-type plant driven by oil engines was used successfully. The usual laboratory field-control methods were employed, and a uniformly graded mixture was delivered to the road. Sand, mineral filler and asphalt were hauled from the unloading point on the railroad to the plant in trucks, the asphalt being hauled in a 1,000-gal. distributor tank. The haul on these materials from the railroad to the mixing plant averaged 7½ miles on the entire job.

On the road 3½-in. wood forms were used for the black base, and 2-in. wood frames were used for the top course. The paving was spread and raked to a uniform thickness by hand labor, while a 10-ton, three-wheel, gasoline roller sealed off, and a gasoline tandem roller did the finishing.

DUMPING SURFACE MIXTURE ON BLACK BASE
Black base laid from 10:30 a.m. throughout one day was covered with surfacing up to 10:30 a.m. the following day.



GANG SPREADING AND RAKING SURFACING MIXTURE
The surfacing mixture was aggregate on 10-mesh screen 50 to 70 per cent; fine aggregate passing 10 mesh and filler 25 to 50 per cent, and soluble bitumen 5 to 8 per cent.

ROLLER SEALING OFF ASPHALT SURFACING
The finishing was done with a tandem roller. Both rollers were 10-ton machines, gasoline operated.

Since the base course and wearing surface were both mixed in the same plant and it was considered important to cover all base before it was opened to traffic, a schedule was worked out to change the grading of the material only once during a working day. The plant was started mixing top material each morning and usually had all the base which had been laid the previous day covered by about 10:30 a.m. The base course was laid during the rest of the day and covered the next morning. This system confined all operations to a short section of the road and reduced the length of detours to a minimum. Sections cut through the completed pavement showed a perfect bond between the two courses.

Reviewing the work, it is evident that local materials were used to advantage and that the best possible advantage was taken of all weather conditions necessary to secure a stable sub-base upon which to lay the asphalt pavement. Careful blading and maintenance of the sub-base were required, as well as watchfulness in securing traffic compaction at the proper time and removing traffic should the process of setting-up be delayed and deterioration set in. The completion of the work depended entirely upon the success in meeting and utilizing favorable weather conditions.

The contract was let to the American Asphalt Co., Dallas, Tex., while the engineering supervision was in charge of the author as resident engineer.

Collection and Disposal of Refuse in London

DISPOSAL of house, trade and street refuse within the administrative county of London should be centralized, according to a report made by the Ministry of Health committee on London cleansing, abstracted in the London *Surveyor* for July 11, 1930. (The report may be obtained for 6d. from H. M. Stationery Office, London, England.) The report seems to contemplate the creation of a central body to the end indicated, but so far as the abstract mentioned goes, there is no indication of how the body will be brought into existence. At present the cities of London and Westminster and the 27 boroughs making up the administrative county of London collect and dispose of their refuse independently. The report seems to have been prompted by a special report on London cleansing, as the service is called in England, made over a year ago by J. C. Dawes, inspector of cleansing, Ministry of Health.

Under the scheme outlined each city and borough in the county would continue to collect its refuse at its own expense, as now, but all charges for final disposal, including haulage from the boundaries of the cities and boroughs to the point or points of final disposal, would be in charge of the administrative county. The report recommends that each city and borough should appoint a public cleansing committee of its own to have charge of the work within its boundary and should also appoint "a properly qualified director or officer of public cleansing to function under the local committee." The report states that many of the existing refuse-disposal works in London should be closed as soon as practicable; that there should be as few places of final disposal as possible. It is suggested that street sweepings might be used by local authorities for land reclamation within their own area; and that two or more metropolitan sanitary authorities might join in employing a public cleansing officer.

Conferences between the proposed central refuse-disposal body and the various city and borough sanitary authorities from time to time are advised.

Steel Constructors Review Progress and Business

Highway Bridges, Steel Floors, Fireproofing and Market Extension Considered at Eighth Annual Convention at Pinehurst, N. C.—Business Nearly as Good as in 1929 With Plants at 75 Per Cent of 400,000-Ton Monthly Capacity

Engineering News-Record Staff Report

CURRENT OPERATIONS in the structural steel fabricating industry are being carried on in particularly satisfactory volume in view of the general slackening in building and other industries. It is probable that the year will end with a decline of less than 5 per cent from the peak of 1929, when 3,553,550 tons were shipped. In 1930 the monthly plant capacity of the industry is 400,000 tons monthly. Operations have been maintained at 75 per cent of this capacity. There is still a considerable lag of consumption behind plant capacity, affording stimulus for extension of markets without more plant construction. A closer relation between demand and productive capacity is the only hope for the industry to realize satisfactory profits. While no more plants are needed, modernization of existing plants is urgently demanded. During the year co-operation has been effected between American steel interests and those in France, England, Germany, Holland, Belgium, Poland and Canada. More field engineers, a larger appropriation for technical research and an advertising campaign large enough to win public support and promote the "battledeck" steel floor are the important immediate requirements for the steel-fabricating industry. Such were some of the statements advanced by Charles N. Fitts, president, Charles F. Abbott, executive director, and Lee H. Miller, chief engineer of the American Institute of Steel Construction, at the eighth annual convention of this body at Pinehurst, N. C., Oct. 28 to Nov. 1. Their views were substantiated by other members of the industry, of whom about 225 were present. Next year's convention will be held at White Sulphur Springs, W. Va.

Notable Speakers

The annual banquet was addressed by E. W. Beatty, president, Canadian Pacific Railway Co., who discussed the relation of transportation to the future of Canada and of the British Empire. James A. Farrell, president, and E. P. Thomas, vice-president, United States Steel Corp., followed Mr. Beatty with addresses bearing on the economic problems confronting the steel industry. Mr. Farrell praised the work of the Institute as serving the public and benefiting the industry. "It demonstrates," said Mr. Farrell, "that individual success and prosperity are based primarily upon the prosperity of the industry itself." In regard to excess plant capacity, he sees the only sure panacea in increased consumption. Competition with reinforced concrete should be governed by facts free from misleading statements. "Practicability and sound engineering practice," said Mr. Farrell, "can and should determine the limitations of each." Small fabricating plants should be encouraged, he said, if for no other reason than that their small customers may develop into large consumers.

Aims and Accomplishments

In planning ways and means of developing the structural-steel industry, the Institute has placed numerous activities in operation which are of general interest and import. These aims and the degree of accomplishment attained were reviewed. The standard specification for structural steel, involving the 18,000-lb. unit stress and other important changes, has been adopted in 42 cities during the year. Twenty-eight other cities are permitting its use under their existing codes. Chicago was pointed out as the only major city that is not using the specification. The code of standard practice, outlining methods of purchase and sale, has been put into wider practice. During the year the total number of standard handbooks of structural shapes and design data published has been increased to 75,000. A new booklet on stadium design has been distributed. The publication of the book on the study of the economic height of the skyscraper and of a new edition of the fact book of structural steel are other accomplishments of the year.

The code of trade practice promulgated at last year's convention has been signed by 322 fabricating plants, including 138 of the 218 members of the Institute. The problem is now to devise effective means of putting the rules into effect. The report of the Institute's committee on trade practice recommended the appointment of a committee composed of non-members of the Institute to give such time as is necessary to the investigation and handling of complaints and the preparation and dissemination of information regarding the code and the practices under it. It was recommended that the new committee consist of a consulting engineer, an experienced builder or lay member and an attorney. The committee would serve the whole steel-fabricating industry and not only the members of the American Institute of Steel Construction.

The artistic bridge competition and awards are to be continued. These include the design competitions among both architectural and engineering students and the granting of awards for the most artistic bridges built during each year. This year the Mount Hope suspension bridge, near Providence, R. I., Robinson & Steinman, engineers, received the award in class A (over $200,000 cost) and the Mount Pleasant rigid-frame bridge in Westchester County, N. Y., the award in class B (under $200,000 cost). Inasmuch as the class A award will probably always be won by an expensive monumental structure, it is planned to create a third class of award next year which will cover the structures costing more than $200,000 but less than about $1,000,000.

Improved Housing

The Steel House—As a means of fostering better construction in the small residence field, the Institute voted to provide an annual competition for the design of residences in which steel is used in its proper place. Some of the fabricators have been active in developing steel-frame houses during the past few years, and this competition is planned to arouse interest and demand on the part of the public, which so far has been somewhat apathetic.

Multiple Dwellings—Uneconomical construction of

apartment houses also came in for discussion. Not only were makeshift fabricating practices, poor walls and floor constructions criticized, but Lee H. Miller, chief engineer of the Institute, laid particular stress on the uneconomical practice of computing loans on the basis of cubical contents, as generally practiced by financing companies. As an example he presented a case in which a speculative builder had occupied 79 per cent of a lot with his building, which had one entrance for eight families on each floor; whereas two architectural designs for the same plot provided identical rooms with better ventilation and light and two and four entrances respectively, the buildings occupying but 67 and 62 per cent of the lot area. On a cubic foot basis the speculative builder got 27 per cent more loan on his building than the architects on theirs. Such waste could be eliminated, in Mr. Miller's opinion, if loaning companies would base loans on value to be determined by an engineering appraisal.

Research

Research work sponsored by the Institute during the year has been along three lines—steel floors, wind design and welding.

Fire tests of the battledeck steel floor are being carried out by the Bureau of Standards at Washington. In twelve series of tests fire will be applied from below by a gas furnace with 48 horizontal venturi tube induction burners. In six additional tests the heat will come from above by burning wood and paper in amounts from 10 to 40 lb. per square foot on the floor. Various degrees of protection will be given the floor, from the bare plate to five different types of covering. Beam protection will vary from a ¾-in. thickness of plaster on metal lath to 2-in. gypsum slabs attached as a suspended ceiling. During tests the floor panels will be loaded from 45 to 160 lb. per square foot. Floor connections providing for both full restraint and free expansion will be provided. An entirely different series of tests for loading will also be carried out to determine the location of the neutral axis of the T-beam section of the floor, the intensity of stress in the upper surface of the plates between supporting beams and the shearing stress on welds. A third series of tests will determine sound conductivity of the floor, using various ceiling and floor protections.

In connection with the battledeck floor, Mr. Miller in his report presented a revised method of construction, which experience has shown is more satisfactory than that first proposed, which used a continuous weld between the edge of the plates and the beams. Buckling of the plates was difficult to eliminate with the continuous welding. The revised method involves the use of button welds placed by hand in holes shop-punched in the plates. These holes, $1\frac{3}{8}$ in. in diameter, are placed on 12-in. centers to develop a required shearing stress of 11,300 lb. per square inch. Such a design has been followed in the new A. O. Smith Co.'s building in Milwaukee, where 150,000 sq.ft. of floor is in place. Here, plates are used that are 72 in. wide, with edges straightened in a planer and slot-punched along the edges and over the continuous beams, which are 24 in. on centers. Mr. Miller pointed out that the design data on the battledeck floor, given in the Institute's Bulletin No. 3, applies only to spans with both ends fixed, and that recognition should be given to the fact that concentrated loadings and exterior floor panels require special consideration.

Welding and flame-cutting are being studied by the Institute's engineering service division. An interesting series of tests has indicated that welded-steel bridge pedestals are equally as strong and as satisfactory as the usual cast pedestal.

Under the direction of Aubrey Weymouth, chief engineer, Post & McCord, and chairman of the Institute's technical research committee, elaborate plans are being made to measure wind velocity and stresses in the Empire State and the Irving Trust buildings in New York City. In the Empire State Building the tower is 134x186 ft., in plan symmetrical and 700 ft. tall, an ideal structure on which to study wind effects. Specially designed recording instruments to measure stress changes simultaneously in the columns and girders are being installed, and in addition other instruments are being placed to measure both positive and negative wind pressures at various levels. Sway will be measured in an open shaft of a fire tower. The tests which have been under way for several years on the American Insurance Union Building at Columbus, Ohio, are definitely announced as unsatisfactory because the rigidity of the tower has not permitted a measurable sway or stress change, even in high winds.

Other Engineering Problems

In the report of the chief engineer other problems of the industry were emphasized. Substitution of lighter sections than called for have been charged against some irresponsible sellers. Rolling mills report it uneconomical to stamp weights on each section. Engineers and architects are urged to guard against this practice by dealing only with responsible fabricators.

Fireproofing of structural steel is believed to have been brought nearer a rational basis by the data which has been collected on the action of steel under load and heat. The absence of test data on the insulating properties of different materials, however, is alleged to account for the difficulty of introducing the Institute's fireproofing specification into building codes. Bearing on this point a paper was given by Henry Schweim, of the Gypsum Association, on gypsum as fireproofing. In reviewing some of the test data collected he showed that steel protected either by poured-in-place or precast gypsum seldom reaches 325 deg. C. at the end of a fire of four-hour duration, at which temperature steel strength is not impaired.

Another problem lies in the difficulties being experienced in selling the wide flanged heavy structural shapes of the different mills, which are competing on a strictly price basis without regard to claimed merits. This price competition was foreseen as a reason for hastening the development of a uniform section. Such action will be particularly necessary if additional mills begin rolling wide flanged shapes.

Highway Bridges

Special emphasis was placed on the subject of highway bridges in a paper by T. W. Dodd, of the St. Joseph (Mo.) Structural Steel Co., entitled "Economy of Highway Bridge Design," which was characterized by many present as the best and most important paper ever delivered by a member before the Institute. Mr. Dodd's paper was based largely upon an examination of span length and foundation cost, effected by means of detailed analyses of various actual structures.

The most generally applicable part of the paper was a series of curves showing economical span lengths for multiple-span construction. Separate series were worked out for steel-beam spans, pony trusses and through trusses. Each curve represented a certain cost of foundations exclusive of abutments, which were assumed to

be of equal cost regardless of the number of spans used to bridge the stream opening. Abscissas were span lengths from 16 to 50 ft. Ordinates were costs per lineal foot of structure. By assuming different span arrangements with a given cost for each pier, the costs per lineal foot of structure were computed and the curves drawn. The low point on each of these curves represented the most economical span length for that particular foundation. Mr. Dodd emphasized the fallacy of spending considerable additional money for architectural treatment in either a concrete or steel bridge, when this treatment was all placed below the floor and invisible both from the roadway above or from adjacent roadways. Essentially a strong sales argument for the use of steel in short-span highway bridges, the paper is nevertheless useful in showing the need for improved analysis of bridge designs and a better knowledge of bridge-building materials on the part of engineers and the public. Mr. Dodd's conclusion was that it is up to the steel industry to foster this need.

In discussion, J. E. Greiner, consulting engineer, Baltimore, pointed out the lack of economy that often results from using standard designs—from making the location fit the structure rather than the structure suitable for the location. "It may be more economical," said Mr. Greiner, "to spend something for an advantage gained than to save something by an advantage lost. When those who pay the cost are persuaded to spend as much for a steel bridge as they are ready to authorize for a concrete bridge, then steel structures of far more pleasing appearance and with architectural effects as satisfactory as can be obtained with concrete will come into general use." Mr. Greiner also suggested that the Institute lend its help to encourage the commercial production of a non-corrosive metal.

Some highly original thoughts on beauty in simple highway spans were presented by P. H. Wood, vice-president, Converse Bridge & Steel Co., Chattanooga, Tenn. Curved members, tubular sections, smoothly welded joints, gracefully cut gusset plates, multicolors in painting, use of stainless steels and aluminum alloys were some of the suggested innovations.

As a conclusion to the discussion of highway bridges, the Institute voted to undertake, as soon as funds became available, the preparation of a uniform highway-bridge specification.

Centralized Specification Writing

P. J. Freeman, chief engineer, bureau of tests and specifications, Allegheny County, Pa., addressed the Institute on the bureau's plan of centralizing specification writing and acceptance tests and inspection in one organization. The set-up, which has proved unusually successful, is predicated upon the belief that the prevention of shipment of materials that do not absolutely follow specifications is constructive co-operation. Approval of subcontracts for all materials and of all subcontractors by the bureau is an essential and highly necessary factor in Allegheny County's plan. Mr. Freeman urged bridge contractors to give more attention to field painting as a means of increasing confidence in the durability of steel.

The unusual building which the A. O. Smith Corp. of Milwaukee has recently completed to house its research and engineering laboratories was described briefly by E. W. Burgess, construction engineer of the company. This building will be described in these columns at a later date.

Another interesting paper supplemented by several reels of motion pictures, was delivered by Edward W. Stearns, assistant chief engineer of the Port of New York Authority, on the construction of the Fort Lee-Hudson River bridge.

Business and Profits

In spite of the substantial volume of business in fabricated structural steel, profits are not adequate and in many instances non-existent. The important question of methods to improve profits and business conduct was presented in several addresses and discussions. Frank Parker, professor of finance, Wharton School of Finance and Commerce, presented some "economic perspectives" of the structural-steel industry, pointing out the necessity for enlightened management and concentrated co-operative research programs looking ten years ahead, involving the entire steel industry. He presented figures to show that rolling mills spend 0.04 per cent of invested capital for research, while such industries as the automotive, chemical and rubber spend over 2 per cent.

R. I. Ingalls, of the Ingalls Iron Works Co., Birmingham, Ala., based his paper on "Future Possibilities" on the premise that these rest entirely with increased knowledge on the part of executives of the details of business. He made specific recommendations for steel fabricators: use full amount of overhead in all bids; study unit prices in detail; quote in outside territories if you can serve them as well as can the local companies; boycott contractors who shop for bids and beat down prices; insist on complete plans from architects and engineers, thus saving unnecessary drawing-room expense; divorce the credit and sales departments; make fair contracts that you intend to live up to and insist upon reciprocal treatment; acquire existing plants instead of building new ones; measure profit on sales and not on capital investment.

Edward H. Cushman, special counsel, Philadelphia Builders' Exchange, addressed the convention on the need for a uniform law for labor and material bonds on public work, pointing out the confusion in the laws of the various states. In its concluding session the Institute passed a resolution to appoint a committee "to advocate uniform laws requiring all contractors on public works to furnish a surety bond or bonds which assures payment to persons furnishing labor or material."

The necessity for trade research as a means of extending the market of steel was discussed by C. O. Hadly, secretary of the recently formed trade research bureau of the U. S. Steel Corp. It is the purpose of this bureau to co-operate with and co-ordinate the work of the various subsidiary companies of the corporation, to co-operate with trade associations, governmental authorities and others.

In a session devoted to a discussion of the price structure in the fabricating-steel industry, it was the consensus that the most practical procedure was for the members to adjust conditions in their local territories. Specific suggestions were: to maintain a one-price policy; to recall all bids that are now outstanding; to refuse to quote or do any business with the shopping type of general contractor; and to expend every effort in urging the adoption of a separate contract for structural steel. Much of this discussion resulted from the presentation of the report of the mill relations committee, by H. A. Fitch of the Kansas City Structural Steel Co. Mr. Fitch was distinctly optimistic following Mr. Farrell's address, which he understood to mean that the steel corporation would do everything possible to maintain a stable price. In Mr. Fitch's opinion the outstanding problem of the steel-fabricating industry could be solved if raw material prices were stable.

Fig. 1—Santa Fe Railway construction camp at Paisano, Tex.

Santa Fe Railway Builds New Line to Mexico

Extension to Presidio, Connecting With Mexican Lines, Will Give Short Route Between Mexico and Kansas City—Motor Trucks Build End-Dump Fills—Mechanical Power for Tracklaying

IMPORTANT railway activities in Texas include the 73-mile line which the Atchison, Topeka & Santa Fe Railway is building from Alpine, Tex., to the Mexican frontier at Presidio, in order to close the gap between the former Kansas City, Mexico & Orient Railway (now a part of the Santa Fe system) and the Orient line in Mexico, which is now an independent concern. Construction work began in August, 1929, and the line was put into service on Nov. 1, 1930.

Joint Track—In its original plans the Orient company had contemplated building its own line for the entire distance, practically paralleling the Southern Pacific Railway for about 15 miles from Alpine to Paisano and crossing the tracks of the latter by a bridge at about 8½ miles. As the Southern Pacific occupies and controls this valley the Orient line was obliged to follow the same general route to Paisano, but as both lines were on a grade of 1 per cent the Orient's location required additional distance and curvature with increased cost, in order to gain headroom for its bridge over the Southern Pacific.

To eliminate these disadvantages the Santa Fe has made a joint trackage agreement with the Southern Pacific for use of its main line from Alpine to Paisano, 11.21 miles, beyond which there will be a short connection to the location of the Orient line. In this way the distance will be 13.56 miles, as against 14.9 miles by the original independent location. This is indicated in Fig. 2.

New Line—Beyond Paisano the new line extends southwest through easy country, the natural grade of which is about 1 per cent for approximately 15 miles. Then the valley of Alamito Creek is followed for approximately 48 miles, crossing the creek five times. After leaving this valley and its drainage area the line extends approximately 10 miles southwest to the Rio Grande at Presidio, Tex. The elevation of Alpine is 4,510 ft.; Paisano, 5,060 ft., and Presidio, 2,550 ft.

At the north and south ends of Alamito Creek are steep rocky bluffs, down which the railroad has to cut its way into deep canyons which have to be filled. The very rough country encountered along the Alamito made it necessary for the line to cross the stream at five places on steel bridges, to reach better supporting ground. The maximum grade is 1 per cent each way and the maximum curvature is 4 deg.

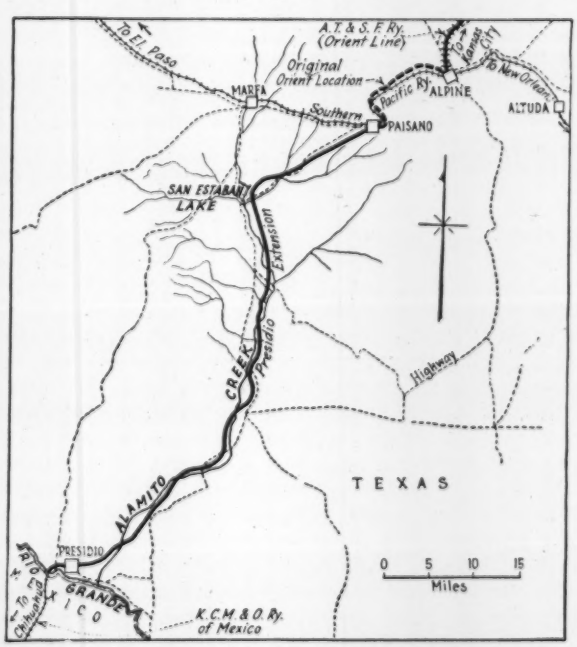


FIG. 2—MAP OF PRESIDIO EXTENSION

Grading—Approximate amounts involved in the grading are as follows: embankment, 2,100,000 cu.yd.; earth excavation, 240,000 cu.yd.; loose rock, 200,000 cu.yd., and solid rock excavation, 570,000 cu.yd. For handling this work there is a force of approximately fifteen power shovels, eight tractors, two elevating graders, 30 trucks, 30 wagons, 100 teams and 300 men. One cut of 63,000 cu.yd. and one fill of 60,000 cu.yd. were handled by using ten 7-yd. crawler dump wagons pulled by tractors. Temporary trestles for the fills have not been used on this line, all fills being made by end-dumping from motor trucks and wagons. Grading in earth and rock is shown in Fig. 4.

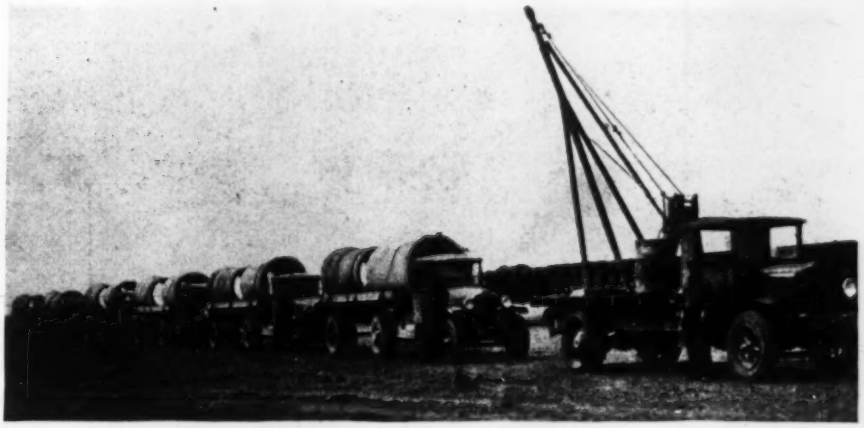


FIG. 3—DISTRIBUTING CULVERT PIPE

The roadbed plans, conforming to the Santa Fe standards, provide for an 18-ft. roadbed on embankments up to 20 ft. in height, and 20-ft. width for greater heights. All cuts are taken out with 26-ft. width, which provides a 10-ft. roadbed with an 8-ft. ditch on each side. This wide roadbed in cuts permits the use of a spreader car for future cleaning and ditching of cuts.

Bridging and Culverts—For the five crossings of Alamito Creek the structures are as follows: (1) at mile 25, three 64-ft. girder spans on concrete piers, with 126 ft. of ballasted-deck trestle approaches; (2) at mile 31, three girder spans of 80, 70 and 64 ft., with 196 ft. of open-deck pile trestle; (3) at mile 42, five 60-ft. girder spans with 210 ft. of ballasted-deck pile trestle; (4) at mile 53, seven 60-ft. girder spans on seven concrete piers and one concrete abutment; (5) at mile 63, a steel viaduct 1,140 ft. long and 70 ft. high, with steel towers and reinforced-concrete pedestals and footings. The second crossing is shown in Fig. 5, with end-dump fill beyond.

At mile 42 the west bank of the stream is a mud flat and about 1,300 ft. of riprap bank protection will be required north of this crossing. At mile 53 a concrete blanket and toe wall extend several hundred feet for bank protection against floods. For the viaduct all of the footing blocks are set on packed sand well below scour.

Concrete pipe culverts are installed in fills more than 10 ft. high and creosoted-wood box culverts in fills of less height. All culverts are placed in advance of the grading. A fleet of motor trucks to distribute the culvert pipe and accompanied by a truck with power derrick for handling the pipe is shown in Fig. 3. For the bridges and drainage openings, the approximate amounts are as follows: 6,104 ft. of pile and frame trestles, 1,307 ft. of T-rail spans, 4,445 ft. of wood box culverts, 2,760 ft. of concrete pipe, 913 cu.yd. of reinforced-concrete box culverts, 9,858 cu.yd. of concrete for bridge piers and 1,612 tons of steel girders.

In addition to the above there is the crossing of the Rio Grande at Presidio, which will be an untreated-pile trestle 1,970 ft. long and approximately 30 ft. high in the channel. During 1928, prior to the acquisition of the Orient line by the Santa Fe, the extension from Alpine to Presidio was under contemplation by the former company, and practically all of the material was accumulated on the Mexican side of the Rio Grande for a combination vehicular and railroad bridge. However, outside interests have recently constructed a vehicular bridge, and it has been decided to build simply a railroad bridge, using the untreated materials already on hand.

Aggregates for the concrete are procured from the streambeds or from gravel pits near the site of each structure. Both sand and gravel are given laboratory tests and the gravel is washed. Cement is procured from the railway company's bins at the various cement manufacturers' plants and is tested before shipment. It is delivered to the contractor on cars at the material yard at Paisano and is trucked to the sites, where portable mixers are installed. The mix is in accordance with water-cement ratio methods.

Piles for trestles are transported by work train over the new track to within 10 miles of the bridge sites and then by trucks to the site. Piles for high trestles are driven by a portable piledriver. At sites for low trestles the openings are filled temporarily with cribbing, and after tracklaying has passed the piles are driven with a trackdriver. All piledrivers on the project are equipped with double-acting steam hammers. Creosoted material is used throughout, and a special feature is that all bolt holes bored in the field are treated with hot creosote by means of a hand-pressure machine recently designed for the purpose. This machine will impregnate the holes for their entire length, giving the same depth of penetration as is done at the treating plants. When creosoted timbers are sawed in the field the cut surfaces are treated with hot creosote.

Tracklaying—Track is laid with 90-lb. relay rail in 33-ft. lengths, with 3,240 ties to the mile. Passing tracks 2,600 ft. long are located at intervals of 9 to 15 miles. All ties are of creosoted pine, except that creosoted hardwood ties are used on curves. Switch ties also are of creosoted hardwood. All ties are tieplated. In work of this kind precautions are taken by the Santa Fe system to insure a maximum service life of treated timbers and ties. In the first place, the lumber is rigidly inspected and graded. After being seasoned the ties are adzed and grooved to seat standard tieplates evenly and true to track gage. The tieplates are made with ribs on the bottom side to fit into the grooves on the ties, so that there will be no damage to the bearing surface of the tie by lateral movement of the plate under traffic. In accordance with modern practice, all ties are bored for spiking before treatment. These holes, which are slightly smaller than the spike to insure a tight fit, extend through

FIG. 4—GRADING IN ROCK CUT
Power shovel casting rock out of the cut.

the tie from top to bottom. The adzing, boring and grooving are done before treatment. With these precautions to prevent deterioration from mechanical causes, and creosote treatment to protect the wood from decay, a long life can be expected from the ties. All the spikes are driven with air hammers, and all bolts are turned up with air wrenches, a feature in laying new track which is proving highly satisfactory. For the spikers the compressor is mounted on a small flat car having a boom at each end from which the hose lines are suspended, so that four men with spiking hammers can work ahead of the four in the rear. The track is surfaced with native material from alongside the track and from approved pits.

The track gang consists of two foremen and about 70 laborers. The contractor used his own locomotive and has a pneumatic machine with spiking, tamping and wrench attachments. Track materials are supplied to the contractor at the material yard and he handles them to the front, laying about 4,000 to 5,000 ft. per day, unless tied up by incomplete grading or other causes. The tracks are earth-surfaced, regular ballasting work being deferred until natural subsidence and solidification have taken place in the roadbed and the volume of traffic justifies ballasting. Surfacing materials are taken from selected local pits and hauled in center-dump cars. The surfacing work has been done quite extensively during periods when tracklaying work was interrupted, although usually the surfacing would be kept up to within 3 miles behind tracklaying.

Fences and Grade Crossings—Right-of-way fencing consists of four barbed wires on creosoted-pine fence posts set a rod apart. A power post-hole boring machine hauled by a tractor was used on part of this work. For road crossings, to insure against warping and loosening of untreated planking under high-speed highway traffic, 4-in. creosoted-gum planking is used on the new line, having the ends beveled and flangeways cut before treatment. To secure an even bearing, sawed ties are placed in the track through the crossing, and the planks are raised to the level of the top of the rail by treated furring strips on the ties.

Buildings and Water Service—At Presidio there will be station buildings of frame construction, but only one intermediate depot will be provided in the entire 73 miles. As this is a stock-raising country, large stockpens with twenty-acre holding tracts will be provided at four points on the line. Section headquarters, at intervals of 24 miles, will consist of a five-room frame cottage for the section foreman and a twelve-room brick bunkhouse for the section laborers.

Of the three water stations two will be supplied from wells between 700 and 800 ft. deep, giving an ample supply of water of excellent quality. Deep-well turbine pumps driven by gasoline motors will deliver the water to the supply tanks. A third water station will be provided at Presidio, where water is found about 80 ft. from the surface. Supply tanks will be 24 ft. in diameter and 30 ft. high, built of copper-bearing steel plates.

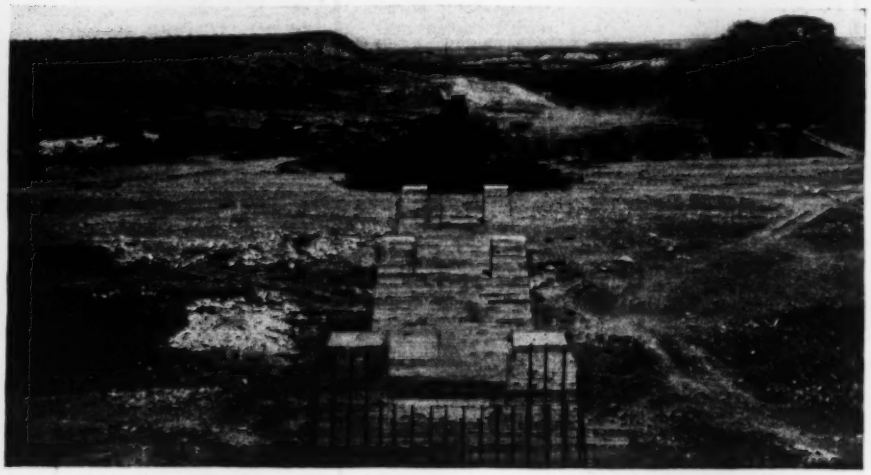


FIG. 5—ALAMITO CREEK CROSSING
Substructure for girder spans. Note motor truck making end-dump fill for approach.

Material Yard—A material yard and Y-track are maintained at Paisano, where are also the headquarters of the contractor and the engineer in charge of construction. Material for the construction of the new line is stored here under the charge of H. E. Ray, general storekeeper of the Atchison, Topeka & Santa Fe Railway.

Engineers and Contractors—This project is being carried out under the direction of G. W. Harris, chief engineer of system, Atchison, Topeka & Santa Fe Railway Co. Construction work is under the direction of T. A. Blair, assistant engineer, at Alpine, Tex. The List Construction Co., Kansas City, Mo., has the contract for the entire project, with J. I. Hallett as general superintendent in charge of construction. This contract covers the grading, pilefriving, bridge erection, structures, fencing and tracklaying for the railway complete.

Sanitary Problems Feature Discussions at Public Health Association Convention

Minimum Flow Control of Rivers Urged by Waterways Pollution Committee—Application of Present Bacterial Standards to Deep-Well Water Questioned—Texas Cities Making Progress in Eliminating Cross-Connections

MORE than a thousand members of the American Public Health Association attended the 59th annual meeting in Fort Worth, Tex., Oct. 27-30. Of the new officers selected, V. M. Ehlers was named chairman of the public health engineering section, with George W. Putnam vice-chairman and Arthur P. Miller secretary. John F. Skinner was named to the section council, and Paul Hansen was made a member of the American Public Health Association nominating committee. E. L. Filby was named as the member from the public health engineering section to the committee on fellowship and membership. The convention followed directly upon the close of the Conference of State Sanitary Engineers, most of whose attendants stayed over for the latter meeting. Meetings of the public health engineers section were characterized by emphasis that there is much for engineers to do in the public health field outside of water supply and sewerage. Plumbing was given considerable prominence with special warning against cross-connections and submerged inlets to plumbing fixtures and swimming pools that might permit backflow through siphoning during low pressure in the mains.

The sanitary significance of river-flow control was emphasized in the report of the committee on waterways pollution, a division of the public health engineering section. Floodflow control measures have in the past been confined principally to the protection of portions of flood plains against overflow, frequently increasing the concentration of floodwater, and consequently the control problem in the lower parts of the valley. The report pointed out that without regard to the ultimate success of this program as regards the control of floodwater, the effect is negative in so far as the ultilization of the floodwater is concerned. Minimum flows have been of primary interest from the standpoint of navigation, domestic and industrial uses in the East, and irrigation use in the West, with a general interest wherever power sites are available. The public health hazards of flooded areas are well known. Periods of minimum flow create problems of public interest when there is a conflict in the various usages of the stream.

These conflicts may be due to a lack of quantity to satisfy the various demands or to an unsatisfactory quality due to an increased concentration of used water returned to the stream. Regardless of the cause of the objectionable properties of used water, unless treatment can remove or modify these to a point where they are not objectionable, diluting water in quantities sufficient to reduce the concentration of the objectionable properties to a point of tolerance is necessary if the public health is to be safeguarded. Another method suggested is the use of storage reservoirs to release the waters impounded during a flood period when the flow in the stream has reached a point low enough to allow an unsatisfactorily high concentration of sewage or industrial waste. The committee concludes that the usefulness of many streams will be greatly increased by any improvement that would result in an increased minimum flow. Inasmuch as the dry weather flow of a stream is due mainly to the discharge of groundwater, it follows that any measure that would result in a greater percolation of rainfall into the porous formations would decrease floodflow and increase the flow during periods of dry weather. The consideration of reforestation in this connection is suggested as a subject for further study.

Contamination of Deep Wells

The rigid application of present bacterial standards to the water supplied by deep wells was questioned by Chester Cohn of the Texas department of health in a paper on the sanitary control of underground water supplies. The writer emphasized the point that there is a greater factor of safety inherent in groundwater purification processes than is ordinarily conceded. A study was made of a large number of samples taken from a group of adjacent deep wells at Houston. A great fluctuation in the B. coli index over the different months of the year could not be correlated with the seasonal rainfall or pumpage from the well.

The writer assumes that the bacteria were introduced during the original drilling of the well and have developed continuously on the inside walls of the pump pit, facing and strainer. The application of a disinfecting solution under pressure to the walls of the well has given encouraging results at several places. One well which had given five consecutive positive analyses for B. coli was disinfected, and since that time, three months ago, has given only one positive test.

Although the natural purification processes to which water in the deeper strata is subjected can usually be relied upon with a great degree of confidence, faulty well construction most frequently results in a polluted supply. Experiments conducted at Sabinal, Tex., showed that properly constructed deep wells, even though located within 25 ft. of cesspools or pit privies, delivered unpolluted water. At Sabinal the upper 60 ft. of the underground material is heavily polluted.

Elimination of Tastes and Odors

The various methods now being employed in the treatment of water supplies to eliminate disagreeable tastes and odors and the effects of those treatments on the bacterial quality were briefly described in a report of the committee on water supply. The methods employed at present include superchlorination followed by various methods of dechlorination, including the use of active carbon, ammonia-chlorine treatment, the direct use of active carbon, potassium permanganate and ozone.

The committee's report expresses the opinion that the superchlorination treatment should make the water more sterile than the usual dosage of chlorine and give greater safety, especially if there is a contact time of several hours before dechlorination. Full approval is given of the superchlorination treatment, providing there is at least 0.5 residual chlorine just prior to dechlorination

and that there has been sufficient contact time. The water should not be completely dechlorinated if the bacterial content of the raw water is high. As active carbon usually dechlorinates completely, chlorine should again be added to attain the desired residual, or a certain portion of the superchlorinated water should be bypassed so that when mixed with the other water it will have the desired residual.

The committee feels that not enough is known at present about the ammonia-chlorine treatment to justify specific recommendations. Although the opinion seems to be fairly general that chloramine is a more effective bactericide than chlorine, the committee advises that a reduction in the usual chlorine dosage be done with great caution. It is evident that there are cases where reduction may be made, but this should be done only after a full investigation has been made as to its effect upon the bacterial quality of the water. It is suggested that until more information is available the residual chlorine concentration of the water leaving the treatment plant be maintained at a point considerably higher than has been used for chlorine alone. With the B. coli standard for safe drinking water limited to one per 100 c.c., water-purification plants must average considerably better than the standard in order that the minimum performance should be within the limits prescribed. They are not justified in reducing the chlorine for taste prevention until they can maintain their high standard of bacterial purity. There is one condition where the ammonia-chlorine treatment is probably better than chlorine alone —where there is a possibility of pollution after the water leaves the purification plant.

Owing to the scarcity of information on the bacterial effect of the use of potassium permanganate and ozone, the committee recommends that in both cases the usual high standard of bacterial purity should be maintained. In conclusion, the committee states that the trend in present treatment methods is toward water of higher bacterial purity, and taste-elimination treatment should increase rather than decrease the bacterial efficiency.

The report of the committee, presented by John R. Baylis, was not concurred in by H. W. Streeter, who declined to indorse the superchlorination treatment if it involved passing water containing residual chlorine on to the filters. He believes strongly that such water is detrimental to the filters. E. Sherman Chase, another member of the committee, disagrees further with the chairman's report in that he does not believe that the B. coli content should be the sole criterion for judging the quality of the water.

Cross-Connection Elimination

The progress being made in several Texas cities in eliminating cross-connections from the water-distribution systems was described in a paper by W. M. Dashiell of Fort Worth and Edgar Whedbee of Dallas, Tex. Prior to about 1926 such cross-connections were permitted throughout practically all the cities of Texas without much thought devoted to the protection of a city's supplies. There were no ordinances or water department regulations dealing with this question, and in nearly all instances no records were kept of the location or any of the details of the connection. As underground water is comparatively plentiful there has gradually developed a cross-connection problem in practically every city of the state.

In the absence of effective legislation, the work of cross-connection elimination has developed rather slowly. The most effective work has been done in co-operation with the United States Public Health Service in its program of certification of water supplies used by common carriers. During 1928-29 surveys were conducted in Dallas, Fort Worth, Houston, San Antonio and several smaller cities to determine the extent of the cross-connection problem and its sanitary significance. This action has been followed in many other places, encouraged by educational and corrective procedure rather than enforcement through ordinance.

The survey made in Dallas shows that there were 44 cross-connections with auxiliary supplies, some of which were subject to gross pollution. Of the auxiliary supplies 37 compared well with the primary supply from the standpoint of potability and safety. Effective July 1, 1929, the Dallas water department instituted a stand-by service charge affecting those industries which had city water connections and maintained a private secondary supply. The charge is based on the average total monthly consumption of each institution from its several water supplies, as determined from the records of the preceding years. In March, 1930, an ordinance was passed prohibiting any new cross-connections, providing for the disconnection of unsafe auxiliary supplies and the improvement of the remainder, and further providing that after June 1, 1935, all cross-connections hitherto permitted should be removed. As the result of the water department's activities, there are at present only five cross-connections with the public water-supply system, and it is expected that all will be eliminated within the next year or two.

A similar survey in Houston showed approximately 57 cross-connections up to the time a new control ordinance was adopted in March, 1930. Information as to the progress of elimination since that time is not available.

The number of cross-connections in San Antonio has been reduced from a total of 32 located by the survey to three at the present time. In this city the survey and attempts to eliminate cross-connections were encouraged by the desire to remove defects from the public water-supply system, listed as such in the water-certification procedure of the United States Public Health Service.

Typhoid Fever and Malarial Control

In a paper by Arthur E. Gorman and Abel Wolman on "Is Water-Borne Typhoid Fever Still a Public Menace?" an excellent statistical study was presented and emphasis laid on the continued vigilance necessary since health officers tend to get interested in new activities and neglect the old. A discussion brought out the fact that the U. S. Geological Survey is organizing an association of water-well drillers, in part, as a means of controlling the development of private rural water supplies.

Papers on malarial control filled the meeting room to overflowing with medical men. General figures indicated that screening in malarial districts costs $0.42 to $1.50 per capita and averages $7 per house. Spraying and maintaining ditches costs about 1c. per capita per day. Some hydro-electric projects in the South are spending $250,000 to $500,000 for malarial control on their properties. Dusting with paris green mixed with hydrated lime, which is selective and cheap, costs $\frac{1}{3}$ to $\frac{1}{2}$c. per acre. Dr. Garrison of Arkansas stated that tourists' camps that were not properly located are spreading malaria.

The committee on sewage disposal confined its activities during the year to the subject of floating solids or scum. Questionnaires in regard to this troublesome

feature were distributed to a great number of municipalities, and the report consisted of a tabulation of experiences from all over the country.

Scum formation was found to occur in either Imhoff or separate digestion tanks but was not universally troublesome. The reports indicated that in most cases it could be handled readily. Its formation is aggravated by the presence of oil, grease and light material, particularly of packing house origin. The relation of gas collectors to scum formation is not conclusive. The evidence points to a tendency for reduced scum formation where gas collectors keep the scum submerged. Control of the pH values of the sludge is sometimes practiced but apparently is not so important as the influence of temperature and stirring devices. Devices for recirculation of the liquid above the sludge and stirring the material appear to be helpful in reducing the scum formation.

The committee on manual recommended the preparation of a public health engineers' manual to be incorporated with the manual on public health about to be prepared by A.P.H.A. as a whole.

The public health engineering section authorized the following committees: A joint committee with the A.W.W.A. on sanitary rating of water works; committee on noises; committee on atmospheric pollution; a committee on industrial plant sanitation.

Letters to the Editor

Cinder Concrete

Sir—In answer to R. C. Toensfeldt's letter published in the *Engineering News-Record*, July 24, 1930, p. 148, under the caption of "Cinder Concrete Barred in Many Cities," the writer notices that evidently Mr. Toensfeldt is a member of the school that is constantly crying, "There's sulphur in them thar cinders." The article admits that cinder concrete has been successfully used in New York City for many years, and that it is only the cinders from Mid-Western bituminous coal that are harmful.

Twenty-five years ago we heard the same cry regarding anthracite cinders. In the Mid-West many failures attributed to the corrosive action of cinder concrete on steel can be explained by the fact that the concrete was not properly constructed. Any experienced engineer knows that when a low-compressive-strength concrete reinforced with steel is exposed to the elements corrosion of the steel is likely to result.

In bituminous cinder concrete used as floor fill over hollow tile arches there have been occasional reports of corrosion of the steel conduits. All of this corrosion is blamed on the "sulphur in them thar cinders." The writer has seen conduits corroded in stone concrete fill. However, in the stone concrete failures electrolysis was the war cry and not sulphur. He has also seen, in cases where conduits have corroded in cinder concrete fill, that the contractor evidently forgot to add cement to the water, cinder and sand. However, the easiest way to explain and to cover up errors in construction or design when cinder concrete is used is to shout "There's sulphur in them thar cinders." The absurdity of the situation, however, comes from the fact there is more sulphur in slag than in cinders, also there is more sulphur in some sand than in the average boiler house bituminous cinders.

There is on the market today an excellent building unit, known as cinder concrete blocks. The American Concrete Institute recognizes these blocks as first-class construction when meeting their standard specifications. These specifications actually call for about 1,500-lb. cinder concrete in 28 days. This specification insures plenty of cement in the mix and a good grade of hard cinders. Tests made by the Western Society of Engineers show that a 1:2:5 and a 1:3:5 mix will give this strength using bituminous cinders. Strangely, the cinder block people also make cinder concrete lintels reinforced with steel. In the Middle West bituminous cinders are used. No corrosion of steel has resulted. Also, in the blocks themselves grounds are nailed directly into the cinder concrete: result, no corrosion of the steel wire nail. In some of the cities where cinder concrete construction is barred, cinder block is allowed—seems inconsistent, doesn't it? Also, the American Concrete Institute bars cinders as an aggregate in its Joint Building Code, but another committee of the institute writes a specification covering its use—consistent, isn't it?

We know cinder concrete is used successfully in New York City. The sulphur content of these cinders runs around nine-tenths of 1 per cent. We know from the experience of the cinder block people that 1,500 lb. cinder concrete will protect reinforcing steel under ordinary conditions. Also, we know that there are plenty of bituminous cinders available, low in combustible matter and sulphur content. Why, then, cannot cinder concrete be specified, the same as other concretes? Let us stop this constant war cry about corrosion of steel. Cinder concrete is coming whether we like it or not, because it is an economical and safe construction. Why not put cinder concrete on the same basis for concrete floors as we have for walls?

M. E. Capouch.

Chicago, Ill.,
Sept. 10, 1930.

Flow of Water Around Bends

Sir—We were interested to note the results of the investigations carried on at the hydraulic laboratory of the University of Iowa on "Hydraulic Characteristics of Flow of Water Around Bends," published in *Engineering News-Record* of Sept. 4, 1930, with particular reference to the statement, "The water with highest velocity is not along the outer bank, as commonly supposed, but is along the inner bank." However, the results of certain field data as collected by engineers engaged in making streamflow measurements tend to disprove the above statement as applied to flow in natural channels.

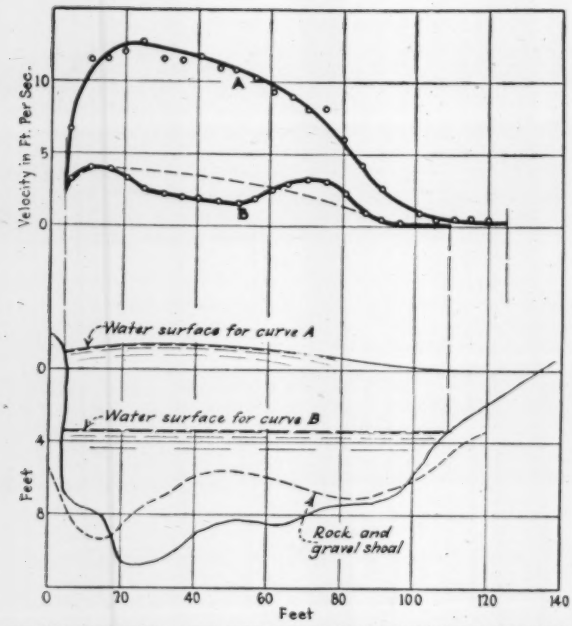
The data referred to were collected on the North Branch of the Potomac River about 300 yd. above the junction of Savage River near Piedmont, W. Va., where the river has a bend of almost 180 deg. The measuring section is located well toward the middle of this bend.

The accompanying drawing shows a cross-section of the stream at this point, together with curves of observed surface velocities at high and medium stages. Curve *A* was developed from a discharge measurement made Oct. 22, 1929, stage 8.10 ft., discharge 7,600 sec.-ft. Curve *B* was plotted from a measurement made May 9, 1930, stage 4.2 ft., discharge 862 sec.-ft. Two different curves were chosen to prove that one was not an exception.

The velocities of curve *B* are influenced by the presence of a bar of boulder and gravel near the middle of the channel and about 80 yd. above measurement section. The dotted line on the stream cross-section shows how the cross-section looks at the bar. Because of the bar, the velocity at measurement section is decreased near midstream, and increased nearer the edges. However, it seems significant that the maximum velocity still occurs near the outer bank. A dashed line has been drawn to represent what we believe curve *B* would resemble if it were not for the effect of the bar mentioned above.

At the flood stage, represented by curve *A*, the effect of the above-mentioned bar becomes entirely negligible, and we find a situation which cannot be mistaken. While the observed velocities do not fall entirely on the smooth curve, they do point steadfastly to the fact that the maximum is at about station 25, or approximately only one-fifth the distance from the outer edge of the curve.

We feel that the conditions represented by this latter curve are most typical of flow of water in natural channels. At this stage the amount of water flowing and the velocities attained by it are sufficient to overcome the effect of channel



CROSS-SECTION AND VELOCITY DISTRIBUTION CURVES

irregularities, and leave at the dominating factor, the curvature of the channel, in which we are chiefly interested. We submit this as evidence that, as commonly accepted, the maximum velocity of flow in natural channel is near the outside of the curve.

There is another feature concerning the measurement on Oct. 22, 1929, which we feel is of interest. By simultaneous readings on the two gages set to same datum, it was found that in the same measuring section and at the same moment the elevation of water surface at station 30 was 9.4 ft., while at station 100 the elevation was 8.1 ft. These two stations, of course, are on the same cross-section of the stream, at right angles to the current. Will any one venture an explanation of the phenomenon?

WILLIAM D. MITCHELL,
L. HARROLD,
Junior Hydraulic Engineers.

Washington, D.C.,
Sept. 23, 1930.

Exaggerated Savings Attributed to Shortened Highways

Sir—In *Engineering News-Record*, Sept. 25, 1930, p. 493, W. A. Van Duzer of the Pennsylvania state highway department includes in his article an estimate for the savings in operating costs of motor vehicles due to a reduction in distance by relocation. This estimate and many similar ones, such as that given by Professor Agg in his chapter on economic comparisons of roadway surfaces ("Construction of Roads and Pavements," McGraw-Hill, 1923), appear unsound as to accounting. Certain items of operating cost are only partly, or not at all, affected by mileage traveled, and cannot therefore be properly considered as being saved by a reduction in distance.

Many other engineers must have observed that the capitalized value of operating savings so estimated will cover a construction cost so large as to be palpably absurd. In the above-mentioned case, Mr. Van Duzer's estimated saving of $28,000 a year would justify an expenditure of $470,000 to reduce a distance less than a thousand feet.

Certain of the operating costs of an automobile are dependent on time. Of these the most important are garage rent, interest on investment and depreciation. For the average passenger car, the time factor probably accounts for about half the total depreciation (including obsolescence). Personal property tax and fire and theft insurance may be said to depend entirely on time.

Another group of items depends largely on surface type and roughness and density of traffic. Depreciation on smooth rural highway probably averages about two-thirds of the depreciation for the mean of all types. Tire wear and repairs will also be less. Since the large majority of liability claims arise inside corporate limits, this item is also decreased.

TABLE OF AUTOMOBILE OPERATING EXPENSES

Item	Total	Per Cent	Mileage Charge
Depreciation	$0.0250	33.3	$0.0083
Gasoline	.0150	81.0	.0122
Oil	.0035	100.0	.0035
Tires	.0043	75.0	.0032
Greasing	.0015	100.0	.0015
Repairs	.0062	66.7	.0042
Interest	.0038	0.0	.....
License and taxes	.0012	0.0	.....
Garage rent	.0050	0.0	.....
Fire and theft insurance	.0012	0.0	.....
Liability insurance	.0033	50.0	.0017
Totals	$0.0700	.....	$0.0346

Per cent of total cost chargeable to mileage, 49.5.

License fees and gas taxes, the proceeds of which go to the highway department, cannot be included if the cost of maintenance and sinking fund charges for the project are in the estimate, since it would make this charge appear twice. In no event can a large increase in sinking fund charges be used to justify a decrease in revenue.

Incorporating the above in a table of operating costs, it appears that only about one-half of the total operating costs can be considered to vary directly with mileage on a smooth rural highway. In applying the result of any traffic census it should be borne in mind that a proportion of passenger car traffic is recreational, or without definite destination, and for this type no expenditure for the sole purpose of distance elimination is justified.

In the accompanying table the first column is intended to give total operating cost reduced to a mileage basis, while the last column includes only that portion of the total which may be said to vary entirely with distance. The figures are from the writer's experience, but are believed to be not far removed from a fair average. In any event, if for the purpose of the estimate, operating charges are assumed at about 3c. per mile, the capitalized saving will more nearly represent the expenditure which may rationally be made to shorten distance.

In preparing the table the following assumptions have been made: initial cost of car, $1,200; traded in for $300 in three years. Mileage run, 36,000. Gasoline at 17c. plus 4c. tax.

T. P. YOUNG.

Cincinnati, Ohio,
Oct. 14, 1930.

Deprecates Pin Discussion

Sir—I have read the various letters which have appeared in the *Engineering News-Record* for several weeks, in regard to the wearing of the shield of the American Society of Civil Engineers, and I would like to state that in my opinion one might assume that the letters appearing on this subject were written by persons who have nothing more to do than to find fault with a custom that has existed for a great many years.

I believe that if members of the engineering profession, whether wearers or non-wearers, would devote their time to the betterment and uplifting of the profession instead of quibbling over such a matter as this, the profession would be better off. I may be wrong, but it seems to me that bringing up a discussion over the wearing of a pin, badge or whatnot would be a subject that might be argued among school children, and not among men of the engineering profession.

Any layman who by chance might pick up and read these articles might question the broadness of the engineering profession, and I trust that I shall never read in *Engineering News-Record*, or any other engineering paper, such a ridiculous discussion as is now being carried on.

I trust that in the future your paper and all other engineering papers will be devoted to matters that are beneficial and uplifting to the engineering profession.

JOHN L. VOGEL,
Bridge Engineer,
Delaware, Lackawanna and Western R.R.

Hoboken, N. J.,
Oct. 27, 1930.

News of the Week

Rivers and Harbors Board Plans Mississippi Trip

In connection with the study on the advisability of revising present flood control plans, the Board of Engineers for Rivers and Harbors will leave St. Louis, Mo., on Nov. 8 and will proceed down the river on the government steamer "Mississippi." Hearings will be held at Memphis on Nov. 10, at Vicksburg on Nov. 13 and at New Orleans on Nov. 16. Local interests and state and municipal engineers have been invited to submit their views on proposed river and harbor work when the steamer reaches these places. The "Mississippi" at present is engaged in carrying the Mississippi River Commission on its inspection trip up the river from New Orleans.

Plans Completed for Vehicular Tunnel Under Thames River

Plans and specifications have now been completed in London, England, for the new $18,000,000 tunnel to be constructed under the Thames to connect Purfleet and Dartford, and it is expected that construction work will start early next year. The tunnel will have a roadway 19 ft. wide with headroom for double deck omnibuses. A 12-ft. pilot tunnel will be driven before work is started on the main project to reveal geological conditions.

A parliamentary bill promoted by the Essex and Kent county councils for the construction of the tunnel has been passed and has received the royal assent. The tunnel will take about three and a half years to build, but when completed it will considerably facilitate traffic between Kent and Essex, at present connected only by a ferry service.

Contract for Construction of Seattle Light Tower Let

Contract for the construction of the City Light Tower, Seattle, Wash., has been awarded to the Sound Construction and Engineering Co., Northern Life Tower, Seattle. A lease between the city of Seattle and the City Light Building Co., has been filed in the county auditor's office, permitting the company to construct the 25-story tower type, fireproof store and office building on city-owned property on Third Ave., between Madison and Spring Sts., to cost $1,750,000. Earl Morrison, architect, has designed the new building, which will cover the entire half block.

The frame of the building will be of reinforced concrete, with exterior of special brick trimmed with terra cotta. A modern floodlighting system is being planned for the building.

While the people voted the city light department authority to lease property for such a building, which will become the property of the city at the end of 50 years, there has been doubt as to whether the huge structure could be financed. Completion of the financing is evidenced by filing of the lease.

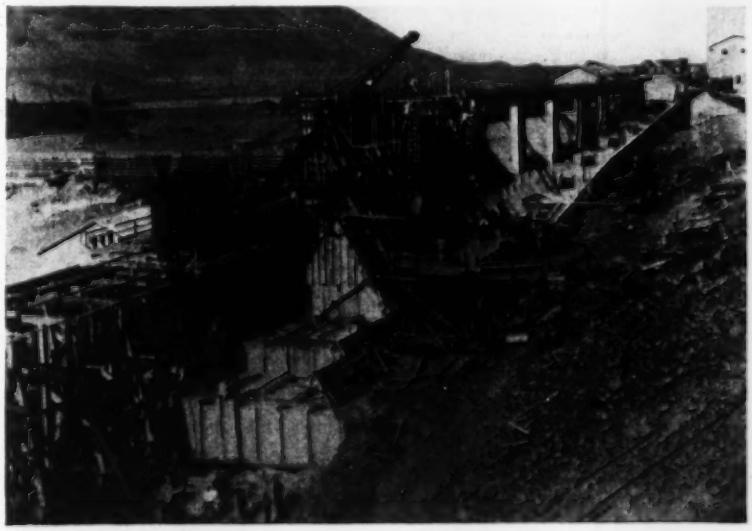
San Francisco Vote Favors Golden Gate Bridge

Incomplete returns from the election on Nov. 4 indicate that voters of San Francisco and vicinity are overwhelmingly in favor of a bond issue for the construction of the Golden Gate bridge, as well as of other bond issues submitted for approval. Early figures on the vote, in round numbers, follow: $35,000,000 Golden Gate bridge bonds, 78,000 for, 26,000 against; $10,000,000 San Francisco harbor improvement bonds, 47,000 for, 6,000 against; $1,200,000 incinerator bonds, 30,000 for, 18,000 against; $850,000 county jail bonds, 37,000 for, 12,000 against.

Three New Bridges Put in Service Over Hackensack River

One state highway and two Pennsylvania Railroad bridges, in close proximity over the Hackensack River near Jersey City, N. J., were put in service this week, replacing adjacent old low-level structures having steam-operated swing spans. All of the new bridges have vertical lift spans providing a maximum clearance of 135 ft. The highway and a two-track freight line bridge are carried on common river piers but have separate superstructures. The third bridge, carrying a double-track passenger line to Jersey City and used also by the Hudson & Manhattan tube trains, is a separate structure.

As the navigation channel is being shifted from the west to the east side of the river the lift spans were all built in place, but it was necessary to leave a fixed span over the old channel out of each bridge during construction. The 245-ft. skewed through truss span to close this gap on the passenger line railroad bridge was built on falsework alongside the lift span. The highway span over the old channel, a 116-ft. deck plate girder span completely encased in gunited concrete and carrying a 40-ft. concrete roadway slab, was erected on two barges. This span has



BUILDING CHANNEL WING WALL FOR ROCK ISLAND PROJECT

Building the north wing wall along the east channel of the Columbia River at the site of the $28,000,000 Rock Island hydro-electric project of the Puget Sound Power & Light Co., which when completed will carry the largest fish ladder ever attempted. This will have a slope of 1 in 10 and will be 20 ft. wide. A duplicate will be built on the opposite side of the river, and a place for a third arranged, so that it may be put in later if the run of salmon up the river should require it. Development of the Rock Island project is being carried forward on a three-shift basis in an attempt to finish pouring concrete for the powerhouse and last spillway sections before Jan. 1.

a 30-deg. skew and the roadway is on a 3½ per cent grade. At high tide, 6 a.m. Nov. 2, both of these spans were floated into position without mishap, the river being closed to navigation for four days. Trains were operating over the new passenger line structure at 11:30 that morning. The highway bridge was opened to traffic Nov. 5. The fixed span of the freight line bridge consists of four 116-ft. plate girders carrying precast deck slabs. These girders were placed one at a time Nov. 2 by a derrick boat. The bridge went into service Nov. 5. All of the old bridges blocking the new channel were removel and the river was opened to navigation Nov 6.

A description of the new structures and details of floating the fixed spans into position will be given in an early issue of *Engineering News-Record.*

Chicago Park and Bridge Work

Plans for extending and improving Lincoln Park, Chicago, at a cost of about $5,000,000, have been approved by the Lincoln Park Commission, and it is stated that part of the work will soon be put under contract. The project includes $960,000 for the superstructure of a bascule bridge, 264 ft. span and 108 ft. wide, to carry the new outer drive across the river, but the plans still have to be approved by the South Park Commission, since the bridge will be a joint structure connecting the two lake-front park systems. Extension of the Lincoln Park area will include building a breakwater and jetty, about $600,000, while a fill 1,600 ft. wide along the shore will add 120 acres to the park and cost nearly $2,000,000.

Railroad Extensions Being Made and Proposed in Oregon

Progress is being made by the Hauser Construction Co., Portland, Ore., on a 61-mile extension for the Oregon Electric Railway Co. from Lebanon to Cascadia, Ore., with three branches, to cost $1,500,000. The line taps timber country in the Cascade Mountains on the Santiam River east of Albany. An existing branch of the Southern Pacific from Albany to Lebanon will be used by the Oregon Electric to connect its new extension with its existing lines. No statement is made by officials of the road at this time as to whether the extension will eventually be electrified.

A second project contemplated by the Oregon Electric is an extension southwest from Eugene, Ore., into the headwaters of the Siuslaw River. This line, which will entail 40 miles of new construction at a cost of $1,300,000, is now before the Interstate Commission for approval.

A third project of the company also before the I.C.C. proposes to acquire the Valley & Siletz Railroad, some 40 miles long, extending westward from Independence, Ore. This project is being protested by the Southern Pacific.

L. D. Blauvelt, Colorado State Highway Engineer, Dies

Louis David Blauvelt, state highway engineer of Colorado and former chief engineer of the Moffat Tunnel Commission, died Oct. 26 in Denver at the age of 63. Born in Tappan, N. Y., Mr. Blauvelt was graduated from Rutgers College, New Brunswick, N. J., in 1885, and immediately started work as rodman and instrument man for the Colorado Midland Railway. After some experience on railway location and construction in Colorado and Washington and on irrigation and reclamation work in New Mexico, he became, in 1892, chief engineer of the Pecos Irrigation & Improvement Co., in New Mexico, for which he located, designed and constructed a dam and irrigation system. Then followed two years as signal engineer for the Chicago & Northwestern Railway in Chicago, after which he returned to Colorado, where he was engaged on the location and construction of a 65-mile section of the Denver, Northwestern & Pacific Railway (Moffat Road), of which he became chief engineer and superintendent. In May, 1918, Mr. Blauvelt was appointed a major in the construction division of the army. He supervised the construction of a $40,000,000 toxic gas plant at Edgewood Arsenal, Md., and a $5,000,000 munitions plant at Alton, Ill., as well as cantonments at Fort Bliss, Tex. He retired from the army as a lieutenant-colonel to become chief engineer for the Moffat Tunnel Commission. In 1921 Mr. Blauvelt was appointed state highway engineer of Colorado, a position he held until his death. He was a member of the American Society of Civil Engineers, a past president of the American Association of State Highway Officials and a vice president of the National Highway Association.

State Sanitary Engineers Discuss Policy Questions at Conference

Discussions of questions of policy to be pursued in the administration of state sanitary engineering featured the three-day Conference of State Sanitary Engineers, held at Fort Worth, Tex., Oct. 25-27. Reports were presented by a number of the committees studying the several phases of such administration. A great deal of attention was paid to the suggestions made that the state sanitary engineers enlarge the field of their activity to embrace the broad field of "environmental sanitation."

The first two sessions were devoted mainly to round-table discussion of policy questions. Problems touched upon included the proper action of the state sanitary engineer in redesigning plans submitted for approval, in requiring submission of operating records from sewage plants and in approving the use of public water supplies for cooling purposes when the water so used is returned to the distribution mains. A report reviewing opinions held throughout the country as to recreational use of public water supplies pointed out the many conflicting factors involved and warned against the possible unsatisfactory results of over-strict regulation.

The future activities of the conference were fully discussed in the light of a committee report outlining the fields of endeavor into which sanitary engineering might profitably enter. Although water supply and sewage treatment have been widely exploited, the other main elements of disease transmission amenable to engineering control are in danger of appropriation by other bodies not so well trained or equipped to administer them satisfactorily. As a result of the discussion, committees were appointed to study industrial hygiene, control of communicable diseases (in co-operation with epidemiologists), sanitation of public schools and sanitation of restaurants.

Doubt Jurisdiction May Bar Klamath River Project

Armed with over a score of petitions and other communications signed by Southern Oregon citizens who approve of the development, and accompanied by a hundred representative taxpayers of the region, officials of the California Oregon Power Co. recently appeared before the State Reclamation Commission of Oregon and submitted arguments in behalf of the utility's application for authority to proceed with the first unit of a $27,000,000 power development along the Klamath River. The initial development will, if allowed by the state, constitute a 34,091-hp. plant at the cost of approximately $4,000,000. The commission was informed that the utility consents to signing a waiver by which it guarantees that, at all times, the use of the water being applied for will be so controlled that no hazards will result to irrigation farmers. The company also agrees to begin construction within 24 hours after the application has been granted.

L. A. Liljequist, deputy attorney-general of Oregon, has advised the commission that it is without legal authority to grant the permit for three reasons: (1) the water of Klamath Lake, the actual source of the Klamath River, was ceded to the federal government in the year 1905 and is now held in trust for the benefit of irrigation and public development of power for irrigation purposes; (2) the surrender of the lake to the government by the state constituted the withdrawal of the water from appropriation by any private corporation or individual; and (3) the trust assumed by the government precludes any release of the water except by the consent and approval in writing of an official of the federal reclamation service.

It was argued by both the assistant

attorney-general and counsel for the protestant Klamath Irrigation District that the waiver offered by the utility would not be legally binding. Testimony and evidence introduced during the hearing, however, tended to show that the company is operating under a contract with the government which contains a similar waiver and that this relinquishment authorizes any federal agent to assume complete control of the utility's dam and regulate the flow of water at any time the irrigationists can establish that water shortage endangers their respective holdings. This waiver being legally operative, contends the power company, a similar agreement with the state should likewise be so.

The commission has taken the applications and arguments under advisement.

Seattle Engineering Unified

Members of the city council of Seattle, Wash., have gone on record in support of the city engineer, R. H. Thomson, in his contention for jurisdiction over all surveys and engineering work for the city light department, as opposed to recommendations from city light superintendent J. D. Ross. Mr. Ross recently asked the council for a special appropriation to employ a field crew to survey a new transmission line to be built into Seattle. Mr. Thomson at once sent the council a note saying that he understood the city charter to give his department jurisdiction over all engineering work for the city and that he had competent men available for a speedy completion of the survey in question without any special appropriation. The council sustained Mr. Thomson and directing that all future work similar to that involved in the dispute be handled by the city engineering department.

50,000-Kw. Gas-Steam-Electric Plant Planned in California

Construction of a 50,000-kw. steam plant at Herndon, on the San Joaquin River, about ten miles north of Fresno, Calif., will be begun immediately by the San Joaquin Light & Power Corp., controlled by the Pacific Gas and Electric Co. The plant, to cost about $4,610,000, will burn natural gas from the Kettleman Hills, which will be piped through a 12-in. main from Fresno. Work will continue over a 20-month period, June 1, 1932, having been set as the date for completion. Adjacent to the steam plant will be built a new substation. At the same time construction will be started on a 100-mile 220-kv. transmission line, costing an additional $2,000,000, which will extend from the new plant to Bellota, where it will tie in with the high-tension network of the Pacific Gas and Electric Co.

State Highway Officials to Discuss Important Questions

Policy with regard to county roads, traffic transport surveys and highways in metropolitan areas will be the more important subjects discussed at the sixteenth annual meeting of the American Association of State Highway Officials to be held in the William Penn Hotel at Pittsburgh, Nov. 17-20. The important question of the relationship of the commission and the state in the matter of local roads will be discussed by Frank T. Sheets, chief highway engineer for Illinois. More than $160,000,000 has been expended under Mr. Sheets' direction during the past three years. He is making a detailed analysis of the whole controverted question concerning local roads. It is expected that the association will adopt a definite policy on local roads.

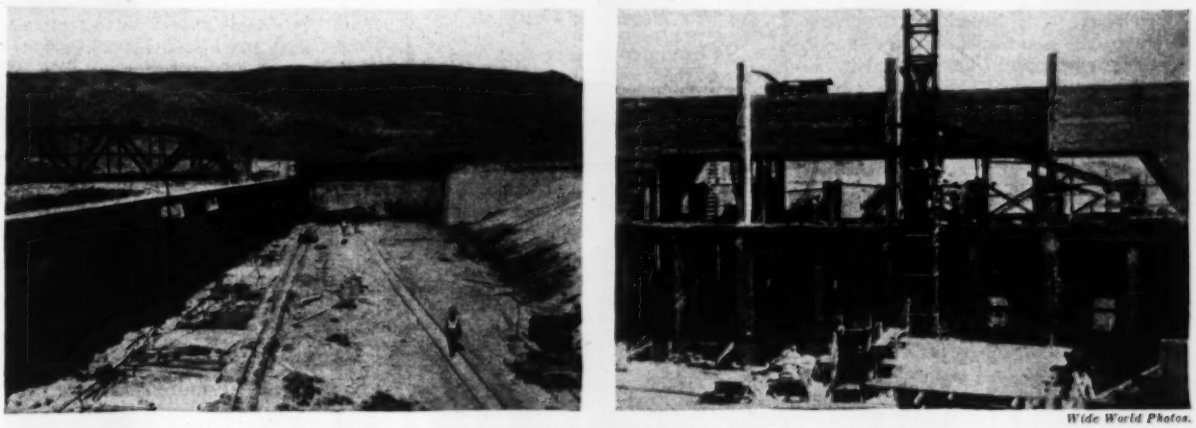
Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, will present practical reasons why traffic transport surveys should be made. He will attempt to show that they are essential to the proper location and construction of highways.

The report of Sidney D. Waldron, president of the Rapid Transit Commission of Detroit, is awaited with interest. He will report on superhighways, bypass highways and other roads best calculated to handle traffic in the areas surrounding large cities.

New Power and Industrial Plant Under Way in West Virginia

Considerable progress has been made on the new hydro-electric and steam-electric power plant developments of subsidiary companies of Union Carbide & Carbon Corp., in the vicinity of Hawks Nest, Gauley Junction and Boncar, W. Va., construction of which started last April. The total installed capacity of the two plants will be about 200,000 hp. Power output is to be utilized by an industrial plant of the Electro Metallurgical Co. which is being erected at Boncar.

The hydro-electric power development is being built by New-Kanawha Power Co. and is located on the New River, between Hawks Nest and Gauley Junction. It will consist of a dam 826 ft. long between abutments, which will raise the water of New River about 60 ft. above low stage at the dam. From the pool above the dam, water will be diverted into penstocks by an intake and tunnel, the latter being about 16,250 ft. in length and 30 ft. in



Wide World Photos.

DEVELOPING HYDRO-ELECTRIC POWER FOR THE HOLY LAND

Plans for utilizing the waters of the Jordan and Yarmouk rivers, in Palestine, for the development of hydro-electric power have progressed to an extent shown in these two illustrations. On the left is shown the concrete lined canal which will connect the two reservoirs serving the power plant on the right appears the forebay and gate structure above the power house. The latter is provided with an overhead superstructure with traveling cranes for lifting the sluice gates. A complete description of the project appeared in *Engineering News-Record*, Aug. 30, 1928, p. 321. Work on the project is being carried on by the Palestine Electric Corp., Ltd., under a governmental charter which gives it full control of the waters of the two rivers for a period of 70 years. Total installed capacity in this plant will be 24,000 hp., of which 16,000 is intended to be active and 8,000 reserve.

diameter. The penstocks will connect with the hydraulic turbines and power station. At about mid-length the tunnel will be provided with an intermediate surge basin and at its lower end with a surge tank of large dimensions.

The power house will contain four units, each rated at 35,000 hp., giving a total installed capacity of 140,000 hp. From the power house a transmission line will run a distance of about 6 miles to the industrial plant at Boncar, where a power connection will be made with the steam-electric power plant. It is estimated that an annual average of more than 80,000 hp. will be delivered to the industrial plant from the hydro-electric station.

The steam-electric power plant is being built by West Virginia Hydro-Electric Co. on the Kanawha River immediately adjacent to the site of the industrial plant at Boncar. It will consist of two steam turbo-generator units, each with a capacity of 22,500 kw.; a total capacity of 45,000 kw., or 60,000 hp. This plant will even out the irregularities of power supply from the hydro-electric power plant.

Industrial Development

The site of the new Electro Metallurgical Co. plant at Boncar contains approximately 105 acres. It is located about 35 miles upstream from Charleston. The plant and industrial village will occupy about half of this property, leaving the rest for future expansion. The existence of thick veins of quartzite which underlie the property is an added advantage in the location of this site. The proposed manufacturing program will require large quantities of this mineral.

A producing coal mine adjoining the industrial site has been purchased to furnish coal for industrial use as well as for the steam-electric power station.

A complete sewerage system, several miles in extent, will be installed at the industrial plant. Filtered and sterilized water for the plant and adjacent housing developments will be supplied by a pumping station, which will also provide a large supply of raw water for industrial purposes.

O. M. Jones, chief engineer of New-Kanawha Power Co., at Glen Ferris, W. Va., is in local charge of the hydro and steam plant installations for L. H. Davis, New York, vice-president of the New-Kanawha Power Co. and the West Virginia Hydro-Electric Co. E. H. Mangen is resident engineer in charge of the industrial plant installation for H. L. Noyes, chief engineer of Electro Metallurgical Co., Niagara Falls, N. Y.

Contract for the construction of the dam, tunnel and power house was let last spring to the Rinehart & Dennis Co. Completion is required by March, 1932. Contract for the design and construction of the steam-electric power plant was let to Ford, Bacon & Davis, New York. Completion is expected by July, 1931. Erection of the first block of buildings of the industrial plant is being done by H. B. Agsten & Sons, Charleston, W. Va.

Railway Alignment Revised

The Interstate Commerce Commission has granted permission to the Northern Pacific Railway and the Oregon-Washington Railroad & Navigation Company to revise the route of their projected branch line tapping a heavily timbered region in northwestern Washington. Further surveys have shown that a line connecting with the Northern Pacific at Moclips instead of Aloha would be shorter and more direct than the original route to the north fork of the Raft River and that minor changes on the route north of the fork to the terminus near Spruce would reduce the total distance from 67 to 59 miles and cut construction cost from $6,421,339 to $5,836,235. The commission has approved the contract under which the Oregon-Washington will operate over the line of the Northern Pacific between Hoquiam and Moclips.

Municipal Ownership League Incorporated in Oregon

The Municipal Ownership League of Oregon has filed articles of incorporation in that state, and the following purposes of the organization appear in the document: "To work for public ownership of all public utilities. First shall be the establishment of a municipally owned and operated electric light and power plant for the city of Portland, and second shall be the establishment of other public utilities from time to time as shall be deemed feasible. To organize subordinate branch leagues in various parts of the city, to establish a newspaper, print pamphlets, give lectures, and to work to secure practical results along the above lines of endeavor. To file on water-power sites for the benefit of public development."

The Business Outlook

It becomes clearer that business, this year, has failed to respond in full measure even to the usual seasonal expectations. This is more clearly evident in primary production and distribution than in general trade, which still appears to be moving up to its holiday high point. The sustained strength of residential building, relative improvement in railroad earnings, steady reduction of stocks of staple cotton and wool textiles and lumber, continued stability of commodity prices, are moderately bullish portents of recuperation. There is a bare possibility that November and December will make a better than seasonal showing, or at least more favorable comparisons with last year than heretofore.

—The Business Week, Nov. 5.

WASHINGTON NOTES

By Paul Wooton
Washington Correspondent

Chief Justice Gives Views on Regulation—Ways of Creating Jobs Receive Much Attention

GOVERNMENTAL regulation was described this week by Charles Evans Hughes, Chief Justice of the U. S. Supreme Court, as a necessity in reconciling the multiplying and complex interests of the community, considered nationally or locally, and the requirements of private initiative and individual liberty. His remarks were addressed to the Association of Practitioners before the Interstate Commerce Commission at its first annual convention in Washington. Mr. Hughes said that if the Interstate Commerce Commission, which dates from 1887, had been established much earlier, with adequate authority, "we should have been spared many of the most difficult of our present problems."

Mr. Hughes' address followed closely upon wide publication of an advertisement by the Associated Gas & Electric System inveighing against "the deadening hand of regulation" and predicting that proposed federal regulation of public utilities would drag them into the same financial straits that are embarrassing the railroads. "To continue its progress in serving the public," said Associated Gas, "the American utility industry must be left with a free hand."

Noting that it was a long time before public opinion could be sufficiently convinced of the need of administrative agencies with broad powers in order to enforce standards which legislatures found it impracticable to apply directly, Mr. Hughes said that it has been characteristic of our civilization that adaptions of the legal structure are generally belated. "We now recognize fully," said the Chief Justice, "the need of continuous and expert investigations, not ex parte or biased by political motives, but impartial and with full and fair hearings and competent discussion. Now we have provided, in nation and states, a host of administrative agencies, and we realize that we have thus been brought to the severest test of the republic, that is, its ability to draw to the complexities of administration the comprehensive knowledge and technical skill, and above all, the reasonableness which will give us the desired fruits of regulation and avoid both the indifference of routine and the arbitrariness of an unintelligent or despotic bureaucracy."

Public Works Employment

The White House announcement that a billion dollar program of public works is under contract and that employment is being provided for a million persons indicates that the federal government is carrying its full part of the load, but it shows also that public works, at best, constitute only a small proportion of the country's activities. In normal times, the volume of engineering work exceeds ten billions, while the total number of

persons gainfully employed in 1929 is estimated to have been 45,000,000.

One of the significant features of the announcement is the rapidity with which the public works program has been expanded. In nine months the increase in government work has been 38 per cent.

Plan Increase in Railway Work

The Chicago & North Western Railway has secured the co-operation of the Interstate Commerce Commission in its plan to provide employment during the next two months by making repairs to equipment not now in service. The road has been permitted by the commission to charge to suspense account $500,000, to be spent for labor and material on idle equipment during the next two months. The commission's order states that this accounting is justified by the desire of the Chicago & North Western to relieve, in so far as it can, the present grave situation with respect to unemployment. The expenditure will be cleared from suspense by charges to operating expenses as the repaired equipment is returned to service but not later, in any event, than the close of 1932.

Other Employment Suggestions

Garage construction on a large scale could be brought about in a very short time if municipal authorities were to serve notice of withdrawal of all parking privileges in congested areas and by forbidding all-night parking in residential areas. Officials making this suggestion in connection with the effort to provide more employment point out that the adoption of such regulations cannot be deferred much longer in many cities. It is contended, however, that there is ample justification for eliminating parking at this time regardless of the employment phase of the question.

Other projects being suggested in connection with unemployment include the lighting of highways having a large volume of traffic and the installation of emergency telephone systems on such roads. While the expenditures for these facilities will have to come from state funds, it is argued that such expenditures are justified on many highways and that installation at this time will be an important contribution toward alleviating the present emergency.

Report Due on Salt Water Barrier

As part of its survey of the nation's water resources, the War Department expects to receive from its Sacramento district on Dec. 15 a report on a comprehensive plan for irrigation in the Sacramento and San Joaquin rivers and for the construction of a salt water barrier across the entrance of Suisun Bay. It is estimated that a period of three or four weeks will be necessary for the report to be approved by the Board of Engineers for Rivers and Harbors and by the Secretary of War before it can be transmitted to Congress. Colonel Thomas Robbins, division engineer of the southern Pacific division, and Major J. R. Matheson, district engineer of the Sacramento district, are in charge of the survey.

Due to the diminished low water flow of the Sacramento and the San Joaquin rivers, the discharge into Suisun Bay has been insufficient to hold back the salt water. The low water flow of the rivers has been reduced during recent years largely because of the increasing amount of water used for irrigation projects. For the double purpose of diverting the excess flowage of the Sacramento River into the San Joaquin River and for preventing the inflow of salt water, California engineers have suggested the construction of a barrier across Suisun Bay. This barrier would be equipped with locks for the use of maritime commerce.

The comprehensive plan for the development of these rivers contemplates the construction of reservoirs to receive the flow at the headwaters during the periods of heavy rainfall. The rainfall of the area drained by the Sacramento River in northern California exceeds that of the San Joaquin, which flows from the south. It is part of the proposal, therefore, to carry part of the excess flow of the Sacramento past the confluence of the two rivers where they flow into the bay, and to force it up the San Joaquin by means of pumpage.

Society Calendar

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington, D. C.; annual meeting, Pittsburgh, Pa., Nov. 17-20.

AMERICAN ROAD BUILDERS ASSOCIATION, Washington, D. C.; annual convention and road show, St. Louis, Mo., Jan. 10-16.

ASPHALT PAVING CONFERENCE, New York City; ninth annual conference, Memphis, Tenn., Dec. 1-5.

NATIONAL ASSOCIATION OF RAILROAD AND PUBLIC UTILITIES COMMISSIONERS, New York City; annual meeting, Charleston, S. C., Nov. 12-15.

FOUR STATES SECTION, American Water Works Association, will hold its fall meeting Nov. 21 at Wilmington, Del.

MID-SOUTH SECTION, American Society of Civil Engineers, will hold its annual meeting at Greenville, Miss., on Nov. 14.

MISSOURI WATER AND SEWERAGE CONFERENCE has elected the following officers: chairman, J. N. Wells, Joplin; vice-chairman, E. E. Wolfe, Hannibal; secretary-treasurer, H. D. Peters, Jefferson City.

MOHAWK VALLEY ENGINEERS CLUB held its first meeting of the fall season on Oct. 29. Speakers were W. C. Garrison, of the Ingersoll-Rand Co., and Joseph Shaw, city engineers of Utica.

NATIONAL CONFERENCE ON GOVERNMENT, to be held Nov. 10-12 at Cleveland, Ohio, will combine the annual meetings of the following: National Municipal League, Governmental Research Association, National Association of Civic Secretaries, American Legislators Association, Proportional Representation League, Ohio State Conference on City Planning, and Ohio Municipal League.

NEW ENGLAND WATER WORKS ASSOCIATION, at the regular monthly meeting to be held at the Engineers Club in Boston on Nov. 12, will hear a description of the new Albany water works by Robert E. Horton and Benjamin Smith, and will also conduct a discussion on the effect of the recent drought on New England water supplies.

SIGNAL SECTION, American Railway Association, has appointed R. H. C. Balliet secretary to succeed H. S. Balliet.

Brief News

BRIDGE CONSTRUCTION at Harper's Ferry, W. Va., has been started by the Baltimore & Ohio Railroad, which plans to replace the present span at that point with a new double track deck plate girder bridge 1,400 ft. long.

LIGHT AND POWER rates charged in Aiken, S. C., by the South Carolina Power Co. are being investigated by the Burns & McDonnell Engineering Co., Kansas City, with a view to the possible establishment of a municipal power plant.

A STEAM-ELECTRIC POWER PLANT with an output of 25,000 kw. is to be built by the Toho Electric Co. of Japan, in Kiushu province.

PORT IMPROVEMENTS costing approximately $2,000,000 will be made along the Montreal waterfront during the next six months. The work, which will start with the closing of navigation in the St. Lawrence, consists chiefly of pier and wharf extensions and improvements.

BIDS for the construction of the House Office building in Washington were submitted Oct. 28 by 29 contractors. Consolidated Engineering Co., Inc., of Baltimore, was low, with a bid of $5,270,000. The high bid of $6,240,000 was offered by Hispanic Builders, Inc., New York City. McCloskey & Co., Philadelphia, was second low, at $5,333,000, while the George A. Fuller Co., Washington, was a close third, bidding $5,345,000. The award will probably be made early in December.

ESTABLISHMENT of an engine run of 904 miles between Jamestown, N. D., and Missoula, Mont., by the Northern Pacific Railroad means that passenger trains now cover the entire distance between Minneapolis and the Pacific coast with only two changes of locomotives. Runs extend from Minneapolis to Jamestown, 344 miles; from Jamestown to Missoula, 904 miles, and from Missoula to Seattle, 656 miles. Five years ago thirteen runs were in effect over this distance.

Obituary

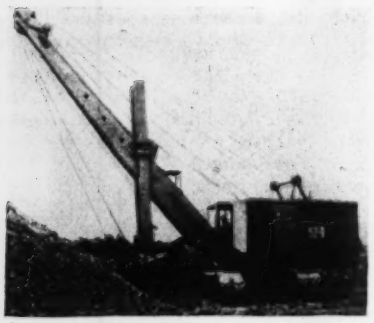
ALEX SIMPSON, JR., engineering contractor of Denver, Colo., was found dead in the garage of his residence on Oct. 20. The death was reported to be accidental, caused by carbon monoxide gas from the motor of his car.

CHARLES CECIL CASS, engineer and contractor of Atlanta, Ga., was found shot to death on the banks of Peachtree Creek on Oct. 24. Members of the family said he had been despondent over ill health. The firm of Cass and Cothran, general contractors, with which Mr. Cass was connected, has been identified with some of the most important construction projects in the southeast, among them being the waterworks system and disposal plant at Fort Lauderdale, Fla.

Construction Equipment and Materials

2¼-Cu.Yd. Shovel Powered by Diesel Motor

Speed in operation is a notable feature of the 52-B diesel excavator recently introduced by the Bucyrus-Erie Co., South Milwaukee, Wis., which can be fitted as shovel, dragline or crane. These units have a bucket capacity of 2¼ cu.yd. The power plant is an Atlas-Bucyrus-Erie improved, four-cycle, six-cylinder, solid injection, full diesel engine so connected as to permit swinging, hoisting and propelling at the same time. The machine is built for shipment on a flat car without



2¼-CU.YD. DIESEL SHOVEL

removing the revolving frame and cab from the base. All high-speed shafts are mounted on ball or roller bearings; transmission and swing reversing gears and all gears below the deck are inclosed and run in oil. The caterpillar-type mountings are extra long and wide to give low ground bearing pressure.

Rubber Coating Protects Surfaces From Abrasion or Corrosion

The value of rubber as a protection against abrasion and corrosion has long been recognized, but its use has been prevented by the expense and difficulty of attaching it securely to the various types of surfaces needing protection. This difficulty is said to be overcome in the Covulc process, announced by the Hitchcock Co., 48 Pearl St., Boston, Mass., by means of which a coating of tough, durable rubber can be permanently applied to conveyor belts or to metal, brick, wood or cement surfaces without the use of heat, steam or pressure. Covulc is a soft plastic rubber compound which, when exposed to the air, rapidly vulcanizes itself and forms a permanent rubber covering on the surface to which it is applied. It can be obtained in various colors and in two forms: as a paste for application on the job, or in sheets already vulcanized to a fabric or wire mesh base. In the latter form it can be cut to size and used for lining chutes, hoppers and in similar applications. Sheets are stocked in 6-ft. rolls ¼ in. thick and 36 and 48 in. wide. They can be cut with ordinary metal shears and bent to any shape. After bolting, the bolt head and joints can be covered with Covulc paste to form a solid lining. The maker states that the paste can be applied in any kind of weather, as it is not affected by sun, heat or rain. It is spread in place, smoothed, and rolled flat, hardening in a few hours.

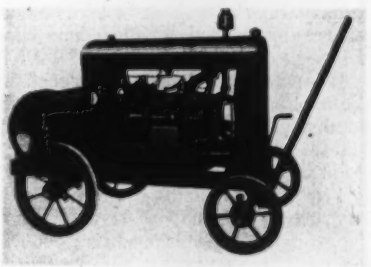
Compact Electric Caisson Pump

Handling water at high heads from deep caissons is the purpose for which Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill., has developed a lightweight, compact electric pump which will handle water containing sand, silt or mineral or acid solutions. Three sizes are available with capacities of from 50 to 200 gal. per minute under heads of from 40 to 110 ft. The electric motors used, 5, 7½ or 10 hp., can be changed on the job to use either alternating or direct current. The pump itself, of the centrifugal type, is direct-connected to the motor through a flexible coupling. The open-type impeller is mounted on a stainless steel shaft. Pump and motor are vertically mounted in a frame consisting of a forged steel yoke, lifting ring and two side channels. A grease-lubricated babbitt bearing is mounted on the pump casing, and a grease-lubricated ball thrust bearing is mounted on the yoke.

ELECTRIC CAISSON PUMP

Small Portable Compressor

Jobs requiring the operation of only a single paving breaker, rock drill or riveting hammer can be served economically by a new small-sized Thor air compressor with a displacement of 74 cu.ft. which has been developed by the Independent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, Ill. The design of this unit compares favorably with larger sizes of Thor compressors and includes full automatic air-pressure control, an idling



72-CU.FT. COMPRESSOR, WHEEL MOUNTED

device, a riveted air receiver, air cleaners and a water-circulating pump. The machine can be obtained with either skid or rubber-tired wheel mounting. The motor used is a LeRoi four-cycle heavy-duty engine with a bore of 3⅜ in. and a stroke of 4½ in. It is equipped with Zenith carburetor and Eiseman high-tension magneto. The compressor itself is of the two-cylinder type, with bore and stroke of 4½ in.

New Publications

Deepwell Pumps—A 4-p. folder of the BYRON JACKSON CO., Berkeley, Calif., gives an account of the principles followed in the construction of deepwell turbine pumps.

Welding Electrodes—Proper selection of electrodes for various types of welding is facilitated by the information contained in a recent bulletin GEC-93 issued by the GENERAL ELECTRIC CO., Schenectady, N. Y.

Ball Bearings—Dimensions, load data and list prices of New Departure ball bearings are given in a 62-p. data book published by the NEW DEPARTURE MFG. CO., Bristol, Conn. A feature of the bulletin is a convenient thumb index.

Earth Moving Equipment—AMERICAN TRACTOR EQUIPMENT CO., Oakland, Calif., gives comparative costs of moving earth by mule or tractor power in an 8-p. booklet "Mules vs. Cats." It has also issued an 8-p. leaflet describing the Ateco hydraulic bulldozer.

Rubber Hose—"The Industrial Hose Handbook," a 78-p. publication of the ELECTRIC HOSE & RUBBER CO., Wilmington, Del., describes the various types of hose now being manufactured and makes recommendations for proper selection in a large variety of industries.

Power Transmission—Silent and roller chains, sprockets and attachments are the subjects of a new 124-p. catalog issued by the UNION CHAIN & MFG. CO., Sandusky, Ohio, which contains not only complete information on these products but also engineering data of practical value in figuring chain drives.

Explosives—Booklets recently issued by the HERCULES POWDER CO., Wilmington, Del., include one describing a new type of explosive known as Hercules Gelamite; a 38-p., compilation of seventeen lectures on the subject of mine foremanship by J. J. Rutledge, chief mine engineer, Maryland Bureau of Mines; and an illustrated catalog in Spanish on explosives, blasting accessories and smokeless powder.

The Business Side of Construction

Contracts Total 243 Millions in October, Average 281 Per Year

Engineering-construction contracts in millions of dollars per week totaled 49 in October, compared with 54 in September. Average for the ten months was 64, and 81 for 1929, 69 for 1928.

The month's total was evenly divided between public and private work. Total public for the ten months is $1,202,000,000, or 1½ per cent more than in 1929; it amounts to 43 per cent of total engineering construction, compared with 33 per cent last year.

October construction by classes as per cent of last year's construction was: water-works 102 per cent, sewers 92, bridges 150, roads 92, federal government 133, buildings 63. Geographically: New England 100, Middle Atlantic 45, South 162, Middle West 118, Mississippi River to Rocky Mountains 95, Far West 86.

Labor, Materials and Overhead in Building Costs

The drop of at least 8 per cent in structure prices this year, shown in the Oct. 2 issue, is due to lower materials prices and overhead, including profit. In view of these reductions and the fact that there has been no concerted cut in wages, there has been a readjustment of the principal component elements of prices. *Engineering News-Record* has gathered from general contractors some current data showing the subdivision of total cost for typical buildings in several cities (Table I).

Accurate data of building costs are not easily compiled, and comparable data still less easy. Can costs of a building erected in winter be compared with those of a building erected in summer? Were bricklayers scarce, as in 1926-27, or plentiful, as in 1929-30? Were freight cars scarce, as in 1921, or were they not, as now? What were the financial conditions at the time the buildings were financed and erected?

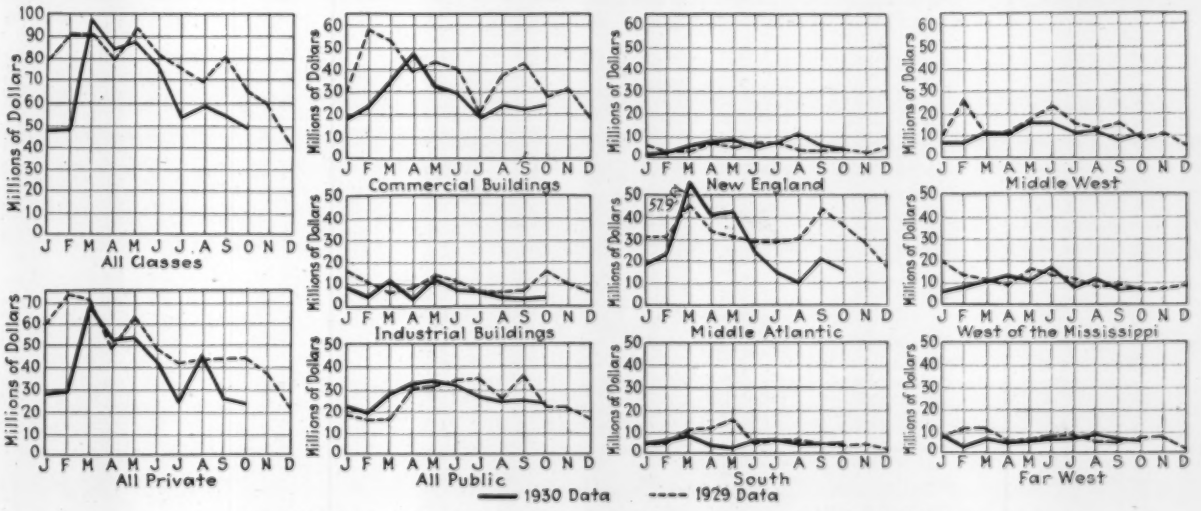
The special nature of buildings is further suggested by the statement of a prominent New York builder that he had abandoned all attempts to reach percentage figures on cost groups for buildings because each building has so many individual problems and idiosyncracies that figures on one are not applicable to the others, even in the same city. Another says: "Percentage figures, to be actually usable, must be confined to a specific building, actually erected by somebody, and under no consideration a hypothetical structure."

The present inquiry was held as closely as possible to a typical loft building erected or completed in 1930. The table shows that it was possible to do this in New York but that the data from other cities cover a half-dozen types of buildings. The figures, however, agree most remarkably. The labor factor varies from 35½ per cent in a San Antonio apartment to 46 per cent on a Salt Lake City school. The

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN OCTOBER, 1930

Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States Oct. 1930	United States Ten Months 1930	United States Ten Months 1929	Canada, Oct., 1930
Water-works	$315	$1,648	$398	$2,470	$487	$1,704	$7,022	$42,313	$41,360	$234
Sewers	465	938	633	2,536	904	674	6,150	71,873	77,905	2,258
Bridges, public	710	4,960	4,442	700	2,519	432	13,763	95,852	84,453	2,531
Excavation	15	13	246	94	68	617	1,053	22,091	25,851	1,342
Streets and roads	1,667	12,076	6,814	11,938	10,033	5,358	47,886	525,545	487,515	1,014
Federal government	909	3,684	551	360	2,221	1,090	8,815	95,422	96,795	.....
Unclassified, public	800	1,830	281	369	180	338	3,798	88,832	109,817	2,493
Buildings, public	4,418	7,459	795	10,520	2,883	7,071	33,146	260,390	260,971	978
Total public	9,299	32,608	14,160	28,987	19,295	17,284	121,633	1,202,318	1,184,667	10,850
Buildings, industrial	3,170	11,229	1,388	2,760	5,386	660	24,593	299,024	481,844	1,905
Buildings, commercial	6,079	36,512	946	19,080	8,176	12,930	83,723	908,483	1,514,608	758
Bridges, private	25	75	.....	525	200	.....	825	18,086	36,421	60
Unclassified, private	593	666	9,100	1,150	655	.....	12,164	383,099	333,899	2,100
Total private	9,867	48,482	11,434	23,515	14,417	13,590	121,305	1,608,692	2,366,772	4,823
OCTOBER TOTAL, 5 weeks	19,166	81,090	25,594	52,502	33,712	30,874	242,938	.....	.....	15,673
September, 1930, 4 weeks	22,862	86,204	16,719	35,084	27,266	26,065	214,200	.....	.....	15,599
October, 1929, 5 weeks	18,639	179,936	14,429	45,199	36,433	35,298	329,934	.....	.....	10,291
Ten months, 1930	242,214	1,134,137	232,949	484,255	426,241	291,214	.....	2,811,010	.....	162,010
Ten months, 1929	207,177	1,504,043	305,819	684,662	518,872	330,866	.....	.....	3,551,439	166,825



CONTRACTS AWARDED, SHOWING TREND BY CLASSES AND SECTIONS

TABLE I—THREE MAJOR ITEMS AS PER CENT OF TOTAL 1930 BUILDING COSTS

	Labor	Materials	Overhead
New York loft	45	35	20
New York loft	45	40	15
New York loft	40	40	20
New York telephone	42	38	20
Trenton loft	42	40	18
Richmond Hotel, 14 story	42	44	14
Minneapolis office, $1,750,000 steel frame, stone-faced, brick-backed	42	48	10
Salt Lake City warehouse, rein.-con. brick, curtain walls $150,000	43	39	18
Salt Lake City high school, $400,000	46	41	13
Anderson, Ind., high school, $450,000	40	45	15
Anderson, Ind., factory, $70,000	38	44	18
San Antonio apartment, rein.-con. frame, brick and cut-stone walls, 8 story, 2 elev., $800,000	35½	49	15½
Average 12 buildings of 1930	42	42	16
Average 8 N. Y. lofts of 1927	33	41	26
Per cent change of each item	+27	—2½	—62

TABLE II—ITEMS OF OVERHEAD AS PER CENT OF TOTAL COST

	1927	1930
Tools and equipment	1.77	0.7
Field supervision	4.11	2.5
Field office	1.15	
General office	4.51	
Insurance	2.00	0.7
Bond	1.50	1.4
Profit	10.00	4.1
Per cent overhead to total cost	25.04	9.4

Note: 1927 data from *Engineering News-Record* Sept. 20, 1927, p. 530; 1930 data by Fred T. Ley & Co.

materials factor varies from 35 per cent on a New York loft to 39 per cent on the San Antonio apartment. The overhead factor varies from 10 per cent on a Minneapolis office to 20 per cent in New York.

The relative proportion of these quantities has changed considerably since 1927, when *Engineering News-Record* gathered similar data (published Sept. 20, 1927, p. 530). Three years ago, according to these figures, the proportion of labor, materials and overhead was 1:1.24:0.79; now they are 1:1:0.38.

The largest decrease has been in overhead, which includes equipment costs, insurance and bonding, and profit. All these items have been reduced, as Table II indicates. The 1927 data are averages for eight New York loft and office buildings, while the 1930 data are from an estimate made by Fred T. Ley & Co. for a $3,500,000 office-and-loft building. This, therefore, is not a direct comparison, but it is to some extent indicative of changed conditions. As M. A. Allen, for the contractor, explains that equipment costs are less than in 1927 because of increased operating efficiency, especially of excavating machinery. Handling brick, tile, high-grade lumber, on the job in cartons, and the use of higher-speed hoisting, have lowered these costs.

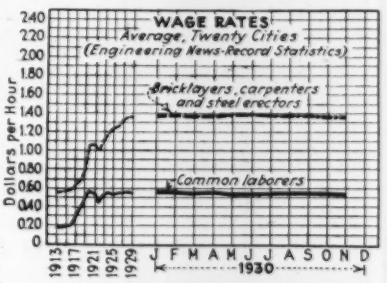
Labor Items

Local conditions in several cities are outlined below:

Albany—Owing to decline in railway traffic, New York Central shops at West Albany, Harmon, Depew, and East Buffalo stopped heavy repair work from Oct. 15 to Nov. 3, throwing out 6,000 men. Contractors on New York state highways at the close of October had a force of 8,150 men as compared with 9,662 on Sept. 30; state forces dropped from 5,386 to 5,023.

Knoxville — Contractors on bridge over the Tennessee River adopted a rate for common laborers of 20c. per hour, against 25 to 30c. paid by local contractors for the same kind of work. The mayor asked the contractors to put the minimum at 30c. since 20c. is the lowest paid common labor in this city since 1913.

New Orleans — Bricklayers voted Oct. 16 to reduce their own wages from $12 to $8, for assurance of ten months of steady work on the Marine Hospital project. The bricklayers are not members of the Central Trades Council, which includes the other skilled crafts and is seeking to raise rates.



Cincinnati—The only large city reporting an increase in residential building in October.

Bernardsville, N. J.—Strike of building trades workers called in behalf of ironworkers, who were refused a daily traveling allowance of $3.50.

St. Louis—A small improvement in construction employment noted in this district; but probably due to an effort to close-in various jobs before winter.

Skilled building trades mechanics receive an average rate of $1.38⅜ per hour, as in October, compared with $1.36⅜ in November, 1929. The skilled rate in manufacturing is 66.7c. Common laborers average 55.87c. per hour compared with 55.96c. in October and 56.3c. in November, 1929. The unskilled rate in manufacturing is 49.2c.

Materials Items

October freight movements of building materials has dropped the following percentages from a year ago; lumber 16; brick and clay products 15; cement 4; lime and plaster 8; aggregates 10; iron and steel 6; roofings 6; explosives 7.

Lumber men report building loans difficult to obtain from banks in all districts except St. Louis and California, and a Chicago realtor states that the prospective home builder can obtain a loan of only 15 per cent of the total value. Lumber has joined with the coal, glue, manganese, and match industries, which expect fur and wheat to follow, to form the Joint Conference On Unfair Russian Competition. Yard stocks are small, but mill reserves are 18 per cent above those of a year ago, with orders amounting only to 21 per cent compared with 34 per cent last year. Stocks are heaviest in the South, North Carolina pine, and California redwood and pine areas. Principal price change was a drop of $1 on 3x12s at Seattle.

Brick prices dropped in four large centers in September and in three in October: Dallas, 50c.; St. Louis, $1:

CURRENT BUILDING AND CONSTRUCTION TRADES WAGE RATES PER HOUR

Advances since last month are indicated by **heavy type**, declines by *italics*

Cities	Bricklayers	Carpenters	Hoisting Engineers	Hod Carriers	Pile Drivers	Structural Iron Workers	Common Labor*
Atlanta	$1.25@1.40	$0.60@.70	$0.60@1.00	$0.50	.....	$0.75@1.25	$0.25@.35
Baltimore	1.75	1.00@1.10	1.00@1.37½	1.00	$0.65	1.00@1.25	.30
Birmingham	1.50	1.00	1.25	.50	.....	1.25	.20@.35
Boston	1.50	1.37½	1.37½	.85	1.27½	1.37½	.45@.80
Cincinnati	1.62½	1.40	1.40	1.00	1.40	1.40	.40@.60
Chicago	1.70	1.62½	1.62½	.97½	1.62½	1.62½	.97½
Cleveland	1.62½	1.37½	1.37½	.87½	1.10	1.50	*.35@.60*
Dallas	1.75	1.12½	1.25	.50@ .75	1.25	1.37½	.35@.50
Denver	1.50@1.62½	1.25	1.25@1.37½	.87½@1.00	.....	1.25	.62½
Detroit	1.56¼	1.00@1.25	1.00@1.10	.90	1.00@1.10	1.00@1.25	.50@.60
Kansas City	1.50	*1.31¼*	*1.31¼*	.90	*1.31¼!*	*1.31¼*	.40@.78¾
Los Angeles	1.37½	1.00	1.00	.75	.87½	1.00	.50
Minneapolis	1.30	.90	.90@1.00	.80	.....	1.00@1.25	.50@.65
New Orleans	1.50	.90	1.25	.75	.80@1.00	1.25	.30@.40
New York	1.92½	1.65	1.92½	1.03½	1.10@1.23¾	1.92½	1.03½
Philadelphia	1.75	1.50	1.02½	.70@1.12½	1.00	1.37½@1.50	.40@.50
Pittsburgh	1.75	1.50	1.43¾@1.56¼	1.12½	.....	1.50	.40@.80
St. Louis	1.75	1.50	*1.50@1.75*	1.15@1.25	1.25	1.75	.40@.87½
San Francisco	1.37½	1.12½	1.12½	.87½	1.12½	1.37½	.68¾
Seattle	1.50	1.12½	1.12½@1.25	1.00	1.12½	1.25	.70
Average	1.58	1.23	1.28	0.8753	1.14	1.35	*0.5587½*
Montreal	1.25	.80	.75	.....	.90	1.00	.30@.35

*Minimum rates are non-union and for construction other than buildings.

New Orleans, $4. Kansas City raised its price 50c.

Cement shipments reached 1930 peak in August with 20,000,000 bbl., or 13 and 9 per cents below peaks of 1929-28. September shipments were 9½ per cent below those of 1929. No price changes.

Tile and lump-lime prices advanced in southern and western cities. Prices of sewer pipe dropped in several cities.

Higher prices of sand and gravel in the Chicago district may result from the Indiana tax on material taken from Lake Michigan and supplying that district. Few price changes in October.

Except in March and July, steel orders have been small this year, but mill wages have not been reduced. Plain shapes sell for $1.60, the price since September; $1.90, a year ago.

Financing to Date

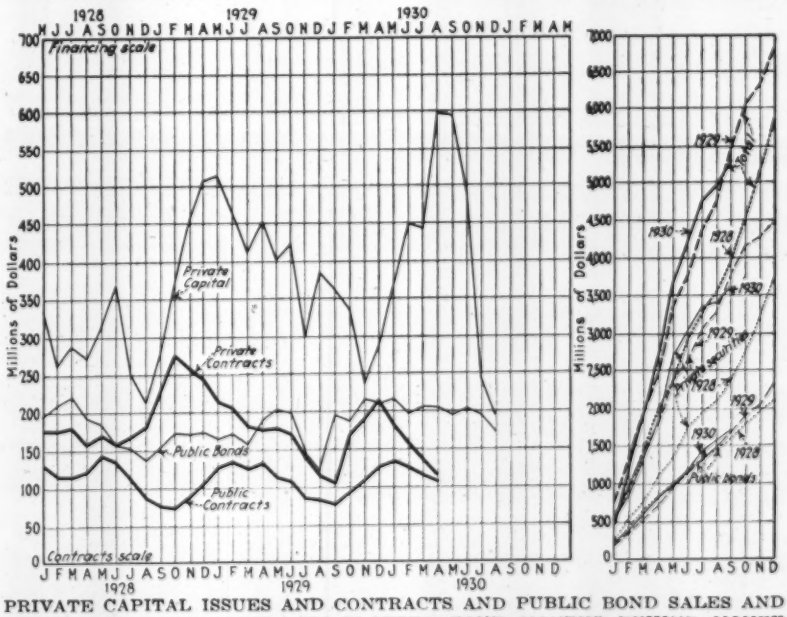
Corporation capital for productive purposes plus public bonds issued in the first nine months of 1930 totaled 5,298 millions, or only 2½ per cent less than in 1929 and one-third more than in 1928. Until September, the year's financing was 4 to 9 per cent ahead of last year's.

In both 1928 and 1929 the ratio of engineering-construction contracts to new capital, for both private and public works, was remarkably even, as shown by the table. For 1930, however, the ratio of private construction to corporation capital has dropped 27 per cent.

The accompanying chart shows the trends by months of financing and construction in the last four years.

PER CENT OF CONTRACTS TO NEW CAPITAL

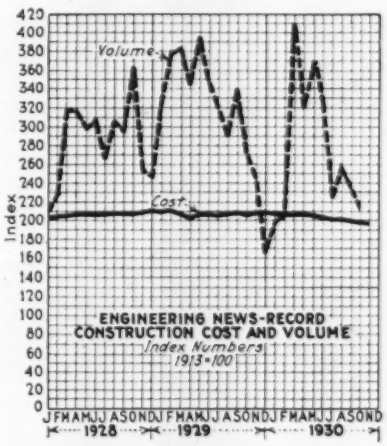
	Private	Public	Total
Year 1928	58	63	62
Year 1929	58	58	58
9 mos. 1930	41	64	49
9 mos. 1929	57	64	59
9 mos 1928	69	67	68



PRIVATE CAPITAL ISSUES AND CONTRACTS AND PUBLIC BOND SALES AND CONTRACTS, WITH CONTRACTS PLOTTED FOUR MONTHS BEHIND MONEY (at left) AND YEARLY ACCUMULATION OF PRIVATE CAPITAL ISSUES AND PUBLIC BOND SALES (at right).

Construction Cost and Volume Index Numbers

Costs have lowered consistently since April and are now 198.54, or 0.09 per cent below the index of a month ago. October volume was 211, or 9 per cent below that of September and 23 per cent below that of October, 1929.



E. N.-R. Cost		E. N.-R. Volume*	
Nov., 1930	198 54	Oct., 1930	211
Oct., 1930	198 72	Sept., 1930	232
Nov., 1929	208 46	Oct., 1929	273
Peak, June, 1929	273 80	1929 (average)	317
1929 (average)	207 02	1928 (average)	287
1913 (average)	100 00		
1929		1929	
January	209 40	January	325
February	210 40	February	378
March	207 78	March	382
April	203 40	April	332
May	205 15	May	395
June	205 65	June	347
July	204 77	July	320
August	205 91	August	290
September	207 57	September	340
October	206 32	October	273
November	208 46	November	245
December	209 46	December	166
1930		1930	
January	208 96	January	199
February	206 46	February	204
March	206 80	March	408
April	207 12	April	320
May	205 86	May	354
June	203 36	June	324
July	200 95	July	226
August	200 95	August	259
September	199 58	September	232
October	198 72	October	211
November	198 54		

*Corrected for price change since 1913.

Low Construction Costs Found by Government Survey

A drop of from 9 to 20 per cent in costs of various types of public-works construction is indicated by a survey just completed by the Division of Public Construction of the Department of Commerce for Colonel Arthur Wood, chairman of the President's Emergency Committee for Employment. Data were obtained from three government departments, carrying out construction of different types in all sections of the country and their reports indicated substantial savings to the taxpayers on projects started now, while prices are low.

The office of the supervising architect in the Treasury Department reports present bids on construction at various points east of the Mississippi for which it has comparative data ranging from 8 to 20 per cent below 1929 estimates and averaging about 14 to 15 below. The decrease is reported as greater on smaller buildings than on projects of major size, and as most pronounced in the regions east of the Mississippi River.

The office of the quartermaster general of the army reports a decrease ranging up to 16 per cent and averaging 9 per cent in the cost per cubic foot of construction of dwellings between 1929 and 1930.

The corps of army engineers reports changes in contract costs in various parts of the country for dredging, rock removal, levees and other river and harbor improvement work, varying from a slight increase in one case, to a decrease of 44 per cent in another, as compared with computed costs during 1929.

The Bureau of Public Roads, which obtains data on unit costs for federal-aid projects throughout the country finds that on the whole, road contracts may be let at as low figures as at any time during the last few years and that, in many cases, costs are from 10 to 15 per cent lower. Wage rates paid on road as well as on building operations have been well sustained, so that the lower figures at which contracts are being awarded represent decrease in the cost of materials, increased efficiency in operation, and the effects of competitive conditions in the contracting industry. Not only have costs of construction dropped, but the cost of securing money has also come down. Interest rates on municipal bond issues dropped from 4.38 per cent in September, 1929, to 3.97 per cent in August, 1930, 8 per cent.

Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type**; declines by *italics*

Building Materials

PORTLAND CEMENT—Prices per barrel, for cement in cloth, *without charge for bags*, cash discount not deducted. Prices are delivered by truck to contractors, except those marked F.O.B., which are manufacturers'. For cement in paper bags add 15c. per bbl:

	Nov. 6, 1930	One Mo. Ago	One Yr. Ago
Atlanta	$3.00	$3.00	$2.35
Baltimore	2.60	2.60	2.40
Birmingham	2.60	2.60	2.40
Boston	2.40	2.40	2.15@2.25
Dallas	2.15	2.15	2.15
Denver	2.61	2.61	2.61
Jersey City	2.60	2.60	2.60
Kansas City	2.60	2.60	2.65
Los Angeles	1.92	1.92	2.42
Montreal	2.20	2.20	1.70
New Orleans	*2.60*	2.65	2.65
New York	2.10	2.10	2.10
Philadelphia	2.10	2.10	2.20
St. Louis	2.15	2.15	2.20
San Francisco	2.64	2.64	2.41
Seattle	2.25	2.25	2.70
(F.O.B.)			
Cedar Rapids	2.23	2.23	2.04
Chicago	1.95	1.95	1.85
Cincinnati	2.14	2.14	1.92
Cleveland	2.04	2.04	1.94
Davenport	2.14	2.14	2.04
Detroit	1.95	1.95	1.95
Duluth	2.04	2.04	1.84
Indianapolis	1.99	1.99	1.89
Milwaukee	2.10	2.10	2.00
Minneapolis	2.27	2.27	2.02
Peoria	2.12	2.12	2.02
Pittsburgh	1.95	1.95	1.85
St. Paul	2.27	2.27	2.02
Toledo	2.10	2.10	2.03

Current mill-prices per barrel, in carloads, without bags, f.o.b.:

Alpena, Mich	$1.65	Limedale, Ind	$1.70
Buffington, Ind	1.70	Mason City, Ia	1.85
Clinchfield, Ga	2.10	Norfolk, Va	1.90
Hannibal, Mo	1.80	Northampton, Pa	1.75
Houston, Tex	1.95	North Birmingham, Ala	1.70
Hudson, N. Y	1.85	Richard City, Tenn	2.05
Ironton, Ohio	1.75	Steelton, Minn	1.85
Iola, Kan	1.85	Universal, Pa	1.70
La Salle, Ill	1.80	Wyandotte, Mich	1.70

SAND AND GRAVEL—Per ton, delivered by dealers. Weight of sand per cu.yd., 1½ tons; gravel, 1½ tons, unless otherwise specified in pounds:

	Gravel		Sand
	1½ In.	¾ In.	
Atlanta	$3.25	$3.25	$2.50
Baltmore	2.40	2.60	1.70
Birmingham, per cu.yd., 2,600 lb	3.50	3.50	3.00
Boston	1.75	1.75	1.15
Chicago, per cu.yd	2.00	2.00	2.00
Cincinnati	1.75	1.75	1.50
Cleveland, per cu.yd., 3,000 lb	2.60	2.60	2.50
Dallas, per cu.yd., 2,750 lb	3.00	3.00	2.50
Denver, per cu.yd., 2,700 lb	1.95	1.95	1.35
Detroit	2.50	1.85	1.65
Kansas City	1.65	1.65	1.65
Los Angeles	1.50	1.50	1.00
Minneapolis, per cu.yd., 2,800 lb	2.40	2.40	1.10
Montreal	1.25	1.25	1.25
New Orleans, per cu.yd., 2,700 lb	3.75	3.75	2.75
New York, per cu.yd	3.40	3.40	2.15
Philadelphia	2.30@3.15	2.30@3.15	1.50@2.31
Pittsburgh	*1.55*	*1.55*	*1.75*
St. Louis	1.55	1.40	1.20
San Francisco	1.75	1.75	1.75
Seattle, per cu.yd., 3,200 lb	1.75	1.75	1.75

Note: New York gravel weighs 2,800@3,000 lb. and sand, 2,700 lb. per cu.yd.

CRUSHED STONE—Per ton, delivered by dealers. Weight per cu.yd., 1½ tons, unless otherwise specified in pounds:

	1½ In.	¾ In.
Atlanta	$3.25	$3.25
Baltimore, per cu.yd	2.75	2.85
Birmingham, limestone, per cu.yd	3.00	3.25
Boston	2.00	2.00
Chicago, limestone, per cu.yd., 2,500 lb	2.00	2.00
Cincinnati	2.25	2.25
Cleveland	2.60	2.60
Dallas, per cu.yd., 2,500 lb	3.25	3.40
Denver, granite, per cu.yd., 2,700 lb	2.50	2.50
Detroit, limestone	2.25	2.25
Kansas City	1.65	1.65
Los Angeles	1.40	1.40
Minneapolis, limestone, per cu.yd., 2,600 lb	2.40	2.40
Montreal	1.90	2.10
New York, limestone, per cu.yd	3.40	3.40
Philadelphia, limestone	2.30@3.15	2.30@3.15
Pittsburgh	2.75	2.75
St. Louis	1.60	1.60
San Francisco, trap rock	1.65	1.65
Seattle, per cu.yd., 2,700 lb	3.00	3.00

CRUSHED SLAG—Manufacturers' quotation on crushed slag in carloads, per net ton, at plant:

	1½-In.	¾-In.	Roofing	Sand
Birmingham, Ala	$0.90	$1.15	$2.05	$0.55
Buffalo District	1.25	1.35	2.25	1.25
Cleveland, Ohio	1.10	1.10	....	1.30
Western Pennsylvania	1.25	1.25	2.00	1.25
Toledo, Ohio	1.25	1.25	1.50	1.25
Youngstown District	1.25	1.35	2.00	1.25

HOLLOW TILE—Building tile per block, delivered by dealers to contractor in lots of 2,000 pieces or over:

	4x12x12	6x12x12	8x12x12	10x12x12	12x12x12
Atlanta	$0.14	$0.18	$0.24	$0.30	$0.36
Baltimore	.105	.....	.20	.....	.26
Birmingham	.09	.127	.174	.218	.261
Boston	.08	.113	.155	.21	.255
Chicago	**.0324**	**.1133**	**.1545**	**.1962**	**.218**
Cincinnati	.06815	.09485	.129	.165	.184
Cleveland	.064	.088	.128	.171	.19
Dallas	**.094**	.112	.179	.251	.....
Denver	.0975	.135	.175	.2125	.25
Detroit	.098	.135	.184	.24	.265
Kansas City	.0525	.077	.184	.24	.265
Los Angeles	.085	.122	.175	.232	.285
Minneapolis	.0611	.081	.10605	.1302	.1737
Montreal	.12*	.....	.22†	.....	.....
New Orleans	*.068*	*.093*	*.13*	*.176*	*.212*
New York	.0864	.1296	.162	.....	.....
Perth Amboy, N. J. (f.o.b.)	.....	.....	.....	.2388	.2956
Philadelphia	.105	.14	.215	.28	.34
Pittsburgh	.052‡	.....	.1175	.....	.1726
St. Louis	.078	.104	.145	**.18**	**.215**
San Francisco	.108	.156	.255	.....	.....
Seattle	.085	.115	.18	.....	.....

*4x4x12. †8x8x12. ‡5x8x12

BRICK—Prices delivered by dealers per thousand, are as follows:

		Paving F.O.B.	
	Common	3x8¼x4-In.	3¼x8¼x4-In.
Atlanta	$16.25	$36.00*	$42.00†
Baltimore	13.00	40.00	46.00
Birmingham	13.50	26.00*	31.00†
Boston	16.00	43.00	47.00
Chicago	12.00	42.00	45.00
Cincinnati	17.50	37.00	39.00
Cleveland	12@14	33.00	36.00
Dallas	*13.50*	**29.50***	.....
Denver	11.00	.....	.....
Detroit	15.50	33.50	36.50
Kansas City	**14.50**	.....	.....
Los Angeles	*8.00*	.....	.....
Minneapolis	12.75	.....	.....
Montreal	20.00	.....	.....
New Orleans	*12.00*	38.00*	45.00
New York	13.00	45.00	50.00
Philadelphia	16.00	40.00	46.00
Pittsburgh	16.00	40.50	45.00
St. Louis	*12.00*	*38.00*	*38.00*
San Francisco	12.00	.....	45.00
Seattle	14.00	48.50**	61.00††

*2¼x8¼x4 in. †3x8¼x4. **2¼x8¼x4. ††3¼x8¼x4.

LIME—Prices delivered by dealers to job:

	Hydrated, per Ton		Lump, per Barrel	
	Finishing	Common	Finishing	Common
Atlanta	$23.00	$15.50	.....	.....
Baltimore	22.00	14.00	$2.55†	.....
Birmingham	22.00	16.00	3.00†	$2.00†
Boston	22.00	15.00	4.00*	3.15*
Chicago	17.00	14.50	15.00‡	15.00‡
Cincinnati	15.80	13.00	.....	.....
Cleveland	18.00	14.00	2.50†	2.50†
Dallas	20.00	.....	.....	1.80†
Denver	32.00	23.75	3.80*	3.00*
Detroit	18.00	14.80	2.20†	2.00†
Kansas City	22.00	17.00	*2.75†*	**2.50†**
Los Angeles	18.90	16.00	2.85†	14.00‡
Minneapolis	25.50	21.00	.....	1.70†
Montreal	19.75	.....	.....	15.00‡
New Orleans	25.00	15.50	**2.65†**	**1.95†**
New York	21.00	13.00	4.10*	3.15*
Philadelphia	22.00	15.00	.....	.....
Pittsburgh	20.00	*15.00*	.....	2.75†
St. Louis	24.00	18.00	2.75†	15.00‡
San Francisco	20.00	20.00	.....	1.8*†
Seattle, paper sacks	35.00	24.00	.....	2.80†

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

CONCRETE BLOCKS—Manufacturers' quotations on standard, 8x8x16-in., hollow, delivered to job, each:

Boston	$0.18@$0.20	Minneapolis	$0.11
Brooklyn and Queens	.12@ .14	New Orleans	*.20*
Cleveland	.16@ .17	Philadelphia	.18@.25
Denver	.22	Pittsburgh	**.20**
Detroit	.15	St. Louis	.17
Kansas City	.18		

SLATE—Roofing, f.o.b., quarry, Bangor, Pa., net, per square:

No. 1 Clear	$9.00@$14.00
No. 1 Ribbon	7.50@ 10.25
Medium Clear	8.00@ 10.50

Road and Paving Materials

PAVING STONE—Carloads or cargo lots of granite blocks, 4x8x4-in., dressed, f.o.b.:

Atlanta	$3.00 per sq.yd.
Baltimore	3.00 per sq.yd.
Boston	135.00 per M.
Chicago, 5 in.	3.25@3.90 per sq.yd.
Cincinnati	110.00 per M.
Cleveland	115@120 per M.
Detroit, 5 in.	3.00 per sq.yd.
Kansas City	3.00 per sq.yd.
Minneapolis, 4½x8x5 in.	2.80 per sq.yd.
Montreal	104.75 per M.
New Orleans	2.80 per sq.yd.
New York, 5 in., Grade 1, 30 blocks per sq.yd.	150.00 per M.
Philadelphia	125.00 per M.
St. Louis, 4x5x8 to 12 in.	3.50 per sq.yd.

Current Prices of Construction Materials

Road and Paving Materials—Continued

WOOD-BLOCK PAVING—Prices, f.o.b., in carloads:

	Size of Block	Treatment	Per Sq.Yd.
Atlanta	3½	16	$2.25
Boston	3½	16	2.25
Chicago	3½	12	2.10
Cincinnati	3½	16	2.35
Kansas City	3½	16	2.75
Minneapolis	3½	16	2.75
Montreal	4	16	4.50
New Orleans	3½	16	2.40
New York	3½	16	2.50
St. Louis	3½	16	2.40

FLAGGING—Alongside dock, New York: Manhattan and Bronx, 4 ft. wide, 24c. per sq.ft.; Queens, 5 ft. wide, 26c. per sq.ft.

CURBING—*New York*: Bluestone, f.o.b. barge, 5x16 in., rough, 90c. per lin.ft., cutting charges extra. *Birmingham*: Limestone, 5x18-in., f.o.b., $1.05 per lin.ft. *St. Louis*: Class "B" straight, 5x16-in., f.o.b., $1.00 per lin.ft.; roundings, $1.35 per lin.ft.

ASPHALT—Manufacturers' quotations per ton in packages (350-lb. bbls. or 425-lb. drums); also in tank-car lots, f.o.b. points listed:

	Package	Tank-car
Atlanta (Mexican)	$20.40	$17.40
Baltimore (Standard Oil, f.o.b. refinery)	21.75	17.75
Birmingham (Mexican)	27.00	23.00
Boston (Mexican)	23.00	18.00
Chicago (Texas)	23.50	19.30
Cincinnati (Kentucky Rock)	.....	12.30
Cleveland	24.00	20.00
Dallas (Texas)	24.40	21.00
Denver (California)	35.00	.....
Detroit (Mexican) (Texas)	19.72	14.87
Kansas City, Mo. (Texas)	21.30	17.00
Los Angeles ("D" Grade, Calif., f.o.b., El Segundo)	18.00	12.00
Maurer, N. J. (Bermudez)	30.00	.....
Maurer, N. J. (Trinidad)	25.00	.....
Minneapolis, (Stanolind, f.o.b., Twin Cities)	23.00	19.10
Montreal (Imperial)	28.00	21.50
New Orleans (Texas)	24.00	21.00
New York (Texas)	22.50	18.50
Philadelphia (Mexican)	18.00	15.00
Pittsburgh (Standard Oil)	24@26	14@18
St. Louis (Venezuelan)	22.50	18.50
San Francisco, (f.o.b. refinery, Oleum, Calif.)	18.00	12.00
Seattle (Standard Oil)	22.40	18.00

ROAD OILS—Manufacturers' quotations, f.o.b., in tank cars, 8,000 gal. minimum, per gal.:

Birmingham, 40@50% asphalt	$0.0525
Birmingham, 50@60% asphalt	.0525
Dallas, 40@50% asphalt	.06
Dallas, 50@60% asphalt	.06
New York, 40@50% asphalt, (at terminal)	.05
New York, 50@60% asphalt, (at terminal)	.05
St. Louis, 40@50% asphalt	.04
St. Louis, 50@60% asphalt	.04

Iron and Steel

PIG IRON—Producers' quotations, per gross ton, f.o.b.:

Birmingham, No. 2 fdry., silicon 1.75@2.25	$14.00
Pittsburgh, basic, incl. freight ($1.76) from Valley	19.63@20.13

STRUCTURAL STEEL—Manufacturers' and dealers' quotations per 100 lb.

	Shapes, 3 to 15-In.	Plates, ¼-In.
Birmingham, large mill lots, f.o.b.	$2.15	$2.15
Chicago, warehouse, delivered	3.00	3.00
Cleveland, warehouse, delivered	3.00	3.00
Dallas, warehouse, delivered	3.75	4.00
New York, warehouse, delivered, up to 3,999 lb.	3.10	3.10
Pittsburgh, large mill lots, f.o.b.	1.60	1.60
St. Louis, warehouse, delivered	3.25	3.25
San Francisco, warehouse, delivered	3.40	3.40

BARS, CONCRETE REINFORCING—Manufacturers' and dealers' quotations on bars rolled from billets, per 100 lb. for ½-in.:

Birmingham, large mill lots, f.o.b.	$2.15
Chicago warehouse, delivered	2.15@3.00
Cleveland, warehouse, delivered	2.25@2.44
Dallas, warehouse, delivered	3.00
New York, warehouse, delivered, over 5 tons	2.70
Pittsburgh, large mill lots, stock lengths, f.o.b.	1.70
St. Louis, warehouse, delivered	3.15
San Francisco, warehouse, delivered	2.50

EXPANDED METAL LATH—Per 100 sq.yd., painted, delivered to job, in less-than-carload lots:

Lb. per Sq.Yd.	New York	Birmingham	Chicago	St. Louis	Dallas	San Francisco
2.2	$18.50	$22.00	$10.10	$20.50	$21.50	$21.50
2.5	19.50	23.00	10.90	21.50	24.00	22.50
3.0	21.00	25.00	12.25	23.00	25.50	25.00
3.4	22.00	26.50	13.10	24.00	30.00	27.00

WIRE REINFORCEMENT FOR CONCRETE—Manufacturers' quotations per 100 sq.ft. in carloads at mills; dealers' delivered, in lots of 10,000 sq.ft. or over; plain 4 in. by 4 in. mesh:

Style Number	Weight in Pounds per 100 sq.ft.	Pittsburgh Mill	Chicago District Mill	Del. From Warehouse: New York	St. Louis	Dallas	San Francisco
032	22	$0.99	$1.01	$1.39	$1.30	....	....
049	28	1.26	1.29	1.76	1.70	....	....
068	35	1.54	1.58	2.18	2.10	....	....
093	45	1.98	2.03	2.79	2.65	....	....
126	57	2.45	2.51	3.45	3.30	....	....
153	68	2.92	2.99	4.13	4.00	....	....
180	78	3.35	3.43	4.73	4.60	....	....

STEEL SHEETS—Manufacturers' and dealers' quotations per 100 lb. base:

	Blue Annealed No. 10*	Black No. 24	Galvanized No. 24
Chicago, warehouse, delivered	$3.35†	$3.80†	$4.35†
Cleveland, warehouse, delivered	3.00	3.60	4.35
New York, warehouse, delivered	3.40	3.90	4.25
Pittsburgh, large mill lots, f.o.b.	1.90@2.00	2.50	3.00
St. Louis, warehouse, delivered	3.45	4.05	4.60
San Francisco, warehouse, delivered	3.80	4.35	4.85

*Light plates. †400 lb. to 3,999 lb.

WIRE ROPE—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River.

	Base
Cast steel round strand rope	20%
Galvanized iron rigging and guy rope (add to list)	12½%
Galvanized steel rigging and guy rope	7½%
Plow steel round strand rope	35%
Round strand iron and iron tiller	5%
"Special Steel" and extra strong cast steel, round strand rope	27½%

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas. Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

RIVETS—Manufacturers' and dealers' quotations on structural rivets, round head, ½-in., full kegs, per 100 lb.:

Chicago, warehouse, delivered	$4.00
Dallas, warehouse, delivered	4.75
Denver	4.80
New York, warehouse, delivered	4.50*
Pittsburgh, large mill lots, f.o.b.	2.75
St. Louis, warehouse, delivered	4.15
San Francisco, warehouse, delivered	5.50
Seattle, warehouse, delivered	4.00

*This price is for full kegs; broken kegs are $6.00 per 100 lb.

STEEL SHEETPILING—The manufacturers' base price, f.o.b., Pittsburgh, for large mill lots is $2.25 per 100 lb.

TERNE PLATE—I C, 8-lb. coating, 20x28-in., f.o.b., Pittsburgh mill:

Per package	$10.30

SHIP SPIKES—Per 100 lb., black, from dealers' warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

	½-In.	⅝-In.	¾-In.
San Francisco	$5.55	$5.10	$4.95
Seattle	7.75	5.65	5.50

Pittsburgh mill base in lots of 200 kegs or more, $3.00 per 100 lb.

WIRE NAILS—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

Pittsburgh Mill	Birmingham	Chicago	St. Louis	Dallas	San Francisco	Montreal
$2.30	$3.30	$3.30	$2.50	$3.75	$3.25	$4.95

SCRAP—The prices following are, f.o.b., per ton, paid by dealers:

	New York Per Gross Ton	Chicago Per Gross Ton	Detroit Per Gross Ton
No. 1 railroad wrought	$8.25	$10.25@$10.75	.....
Stove plate	5.50	8.50@ 9.00	$7.00*
No. 1 machinery cast	8.50	11.75@ 12.25	9.50
Machine shop turnings	5.00	5.00@ 5.50	4.50
Cast borings	4.50	5.00@ 5.50	5.50
Railroad malleable	10.00	11.00@ 13.50	11.00
Re-rolling rails	9.25	11.50@ 14.00	12.00
Re-laying rails, 56@60 lb.	23.00	23.00@ 25.00	.....
Heavy melting steel, No. 1	8.50	11.00@ 11.50	10.50
Iron and steel pipe	7.25	6.50@ 7.00	.....

*Net ton.

FREIGHT RATES—Effective May 20, 1930, on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished) chains, etc., the following freight rates in cents per 100 lb., apply on carload lots of 36,000 lb. or 18 tons:

Atlanta	$0.58	Detroit	$0.265
Baltimore	.27	Kansas City	.71†
Birmingham	.58	New Orleans	.67
Boston	.40	New York	.33
Buffalo	.235	Pacific Coast (all rail)	1.15*
Chicago	.34	Philadelphia	.29
Cincinnati	.265	St. Louis	.39
Cleveland	.185	St. Paul	.60
Denver	1.15*		

*Minimum weight on structurals, 60,000 lb. †Except iron or steel pipe and fittings.

Railway Materials and Supplies

STEEL RAILS—Manufacturers' quotations per gross ton, f.o.b., for large mill lots:

	Pittsburgh	Birmingham	Chicago
Standard openhearth rails	$43.00	$43.00	$43.00
Light rails, 25 to 45 lb.	34.00	34@36	34@36
Re-rolled rails	24@28	34@36	34@36

RAILWAY TIES—For fair-sized orders, f.o.b., the following prices per tie hold:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
New York	Long-leaf sap pine, untreated	$1.05	$1.20
	Creosoted—prices on application		
Birmingham	White oak, creosoted	1.52	1.75
	Southern pine, creosoted	1.25	1.60
	White oak, untreated	1.35	1.70
Chicago	Oak, empty cell, creosoted	1.75	2.30
	Oak, zinc treated	1.55	2.05
	Southern pine, creosoted	1.45	1.90
St. Louis	White oak, untreated	1.00	1.50
	Red oak, creosoted	1.30	1.90
	Sap pine or cypress, untreated	.65	1.20
San Francisco	Douglas fir, green, untreated	.68	.96
	Douglas fir, empty cell, creosoted	1.44	2.55
Montreal	Birch or maple, untreated	.75@1.25	.75@1.25
	Birch or maple, creosoted	1.20@1.30	1.50@1.60

Current Prices of Construction Materials

Railway Supplies—Continued

TRACK SUPPLIES—Manufacturers' and dealers' quotations per 100 lb. f.o.b., Pittsburgh mill, for large mill lots, together with warehouse prices at other places named:

	Pittsburgh	Chicago	Birmingham	St. Louis	San Francisco
Standard spikes, ⅝-in. and larger	$2.80	$3.55	$3.45	$3.65@$3.95	$4.10
Track bolts	3.80	4.55	5.85	4.75@ 5.00	5.10
Standard section angle bars, splice bars or fish plates	2.75	3.40	3.75	.....	.....

Tie plates: Price at Pittsburgh mill, $2.07½ per 100 lb.

Pipe

WROUGHT-STEEL PIPE—Discounts from manufacturers' and dealers' standard lists:

	1 to 3-In. Butt Weld		3½ to 6-In. Lap Weld	
	Black	Galvanized	Black	Galvanized
Chicago, warehouse, delivered	57.3%	44.8%	53.9%	41.4%
Cleveland, warehouse, delivered	53.3%	42.3%	50.8%	37.8%
New York, warehouse, delivered	56.14%	43.6%	52.72%	40.18%
Pittsburgh, large mill lots, f.o.b.	64%	52.5%	61%	49.5%
St. Louis, warehouse, delivered	51%	38%	48%	35%

CAST-IRON PIPE—Prices of U. S. Pipe & Foundry Co., per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots of pipe:

	4-In.	6-In. and Over
Birmingham mill	$40.00@$41.00	$37.00@$38.00
Burlington (N. J.) mill	40.00	37.00
Chicago	48.20@ 49.20	45.20@ 46.20
New York	42.90	39.90
Pittsburgh	48.80@ 49.80	45.80@ 46.80
St. Louis	*46.80@ 47.80*	*43.80@ 44.80*
San Francisco	50.00@ 51.00	47.00@ 48.00

Gas pipe and Class A, $3.00 per ton extra.

SEWER PIPE—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

	6-In.	8-In.	12-In.	18-In.	24-In.	30-In.	36-In†
Atlanta	*$0.15*	*$0.25*	$0.82½	.....	.....	.....	.....
Baltimore	.10	.30	.58	.....	$1.93	.....	$6.50
Birmingham	.25	.40	.65	$1.50	2.75	$3.90	5.85
Boston	.18	.30	.55	1.35	2.25	3.70	6.50
Chicago	.18	.28	.54	1.25	2.25	4.75	6.00
Cincinnati	.135	.21	.405	1.05	1.89	3.456	5.4325
Cleveland	.189	.294	.567	1.35	2.43	4.824	7.38
Dallas	.25	.375	.68	1.60	2.75	.....	.....
Denver	.161	.23	.414	.816	1.44	.....	.....
Detroit	.18	.28	.6075	1.50	2.70	5.12	7.91
Kansas City	*.15*	.29	.51	.....	*1.80*	*3.60*	.....
Los Angeles	.21	.29	.52	1.186	2.03	3.39	5.09
Minneapolis	.16	.25	.50	1.15	1.85	3.49	4.97
Montreal	.36	.53	.78	1.48	2.75	4.20	.....
New Orleans	*.18*	*.30*	*.54*	*1.02*	*1.95*	.....	.....
New York	.17	.265	.52	1.30	2.34	4.47	6.86
Philadelphia	.117	.182	.351	1.05	1.89	3.60	5.6375
Pittsburgh	.0945	.147	.2385	.85	1.53	3.024	4.8175
St. Louis	.1645	.26	.468	1.092	1.872	3.65	4.80
San Francisco	.1925	.275	.495	1.155	1.98	3.30	4.95
Seattle	.22	.30	.54	1.26	2.16	3.50	5.50

CLAY DRAIN TILE—Prices delivered by dealers, per 1,000 lin.ft.:

Size, In.	New York	Birm'ham	St. Louis	Dallas	San Fran.	Seattle
4	$55.00	$56.00	$50.00	$63.00	$67.50	$60.00
6	112.00	112.00	85.00	100.00	112.50	112.00

Miscellaneous

LINSEED OIL—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... *$0.104* Chicago.... *$0.106* Minneapolis... *$0.109*

WHITE AND RED LEAD—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.75; White, in oil, $13.75; Red, dry, $13.75; Red, in oil, $15.25.

CHEMICALS—Water, sewage treatment, road work, round lots in the New York market:

Sulphate of aluminum, in bags, per 100 lb	$1.40@$1.45
Sulphate of copper, in bbl., per 100 lb	*4.10@ 4.25*
Soda ash, 58%, in bags, per 100 lb	1.32@ 1.35
Chlorine, cylinders, per lb	.04@ .06
Bleaching powder, in drums, f.o.b. works, per 100 lb	2.00@ 2.10
Calcium chloride, flaked, in drums, f.o.b. works, per ton	22.75

MANILA ROPE—The number of feet per pound for the various sizes is as follows: ½-in., 7-ft., 6-in.; ⅝-in., 6-ft., 1-in.; ¾-in., 4-ft., 5-in.; 1-in., 3-ft., 8-in.; 1¼-in., 2-ft., 5-in.; 1½-in., 1-ft., 8-in. Following prices are quoted by dealers per pound for ½-in. and larger:

Atlanta	$0.35	Kansas City	*$0.25*
Baltimore	.225	Los Angeles	.25
Birmingham	.26	Minneapolis	*.19*
Boston	.215	Montreal	.185
Chicago	*.17*	New Orleans	.25
Cincinnati	.21	New York	.205
Cleveland	.21	Philadelphia	.23
Dallas	.23	San Francisco	*.193*
Denver	.22	Seattle	.195
Detroit	*.225*	St. Louis	*.18@.205*

BUILDING PAPER—Black, 50-lb., in carloads, per roll of 500 sq.ft., .o.b., producing point $2.40

SLATERS FELT—In carloads, per roll, f.o.b., producing point $0.90

ROOFING MATERIALS—Price f.o.b., New York, delivered by dealers to contractors in carloads:

Asphalt felt, per 100 lb	$3.00
Tar felt, per 100 lb	3.00
Asphalt coating, per gal	.34½
Tar pitch, in 350 lb. barrels, per ton	28.00

PREPARED ROOFINGS—Prices delivered by dealers to contractors, in carloads, f.o.b. New York, per square:

Single shingles, slate finish, sufficient to cover 100 sq.ft.	$6.12
Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label	6.00
Slate surfaced roofing in rolls weighing 85 to 90 lbs.	2.50

WINDOW GLASS—United inches 25, bracket size 6x8 to 10x15, single or double thickness, discount from jobbers' list (Sept. 15, 1928), at New York warehouses:
AA..... 83% A..... 86% B..... 88%

EXPLOSIVES—Manufacturers' quotations per pound for dynamite delivered in small lots, under 200 lb.:

	Gelatin 40%	Gelatin 60%		Gelatin 40%	Gelatin 60%
Atlanta	$0.22	$0.245	Los Angeles, f.o.b.†	$0.1875	$0.2225
Baltimore	.215	.2375	Minneapolis	.2225	.2450
Birmingham	.22	.245	Montreal	.20	.24
Boston	.225	.255	New Orleans	.195	.22
Chicago	.195*	.22*	New York	.255‡	.2775‡
Cincinnati	.22	.245	Philadelphia	.215	.24
Dallas	*.1875*	*.225*	St. Louis	.215	.235
Denver, f.o.b.	.19	.2125	San Francisco	.155	.18
Kansas City, Mo.	.2025	.2225	Seattle	.1525	.175

*Quantities above 500 lb. but less than a ton. †San Fernando Arsenal. ‡Special gelatin in case lots.

Lumber

Prices Are Per Thousand Feet, Board Measure

New York—Timbers, No. 1 Common, rough, delivered in Manhattan to contractor at site of job, in 20 ft. lengths and under, per M. ft., b.m.:

	Long-leaf Yellow Pine	Douglas Fir
3x4 to 8x8	$50.00	$35.00
3x10 to 10x10	60.00	36.00
3x12 to 12x12	70.00	37.00
3x14 to 14x14	80.00	42.50

Chicago—Prices, f.o.b., in carloads, No. 1 Common, rough, per M. ft. b.m. For delivery to job from stock, in truckloads, add $10 per M. ft., b.m.:

	20 Ft. and Under Long-Leaf Yellow Pine	Up to 32 Ft. Douglas Fir
3x4 to 8x8	$41.50	$39.50
3x10 to 10x10	49.00	39.50
3x12 to 12x12	61.00	39.50
3x14 to 14x14	73.00	40.50

San Francisco—Douglas fir, No. 1 common, rough, at yards. For delivery to contractor at site of job, add $1.50 to $5 per M. ft., b.m.:

	10-16-18 and 20 Ft.	22 and 24 Ft.
3x3 and 4	$30.00	$32.00
3x6 and 8	30.00	32.00
3x10 and 12	30.00	32.00
3x14	33.00	34.00

Other Cities—Delivered by dealers, No. 1 Common, rough, per M. ft., b.m.:

	8x8-In. x 20 Ft. and Under				3x12 to 12x12-In. 20 Ft. and Under	
	Pine	Fir	Hemlock	Spruce	Pine	Fir
Atlanta	$55.00	.....	.....	.....	$65.00	.....
Baltimore	36.00	$50.00	$53.50	$61.00	75.00	$50.25
Birmingham	53.00	.....	.....	.....	56.50	.....
Boston	52.00	45.00	47.00	48.00	59.00	**42.00**
Cincinnati	42.50	55.00	.....	.....	52.50	52.50
Cleveland	58.00	58.00	.....	.....	58.00	58.00
Dallas	55.00	55.00	**55.00**	55.00	55.00	55.00
Denver	.....	50.00	47.50	47.50	.....	55.00
Detroit	53.00	51.00	.....	.....	67.00	51.00
Kansas City	*36.25*	*34.75*	.....	.....	*50.50*	*34.25*
Los Angeles	.....	41.50	.....	.....	.....	41.50
Minneapolis	.....	46.25	.....	.....	.....	46.25@47.75
Montreal	50.00	48.00	.....	.....	56.00	48.00
New Orleans	*40.00*	**49.00**	.....	**45.00**	*56@60*	*42.00*
Philadelphia	50.00	43.00	42.00	48.00	60.00	43.00
Pittsburgh	**75.00**	*65.00*	*65.00*	65.00	**75.00**	*60@65*
St. Louis	**52.50**	*40.00*	*39.00*	.....	**60.00**	*41.00*
Seattle	.....	*19.00*	.....	.....	.....	*20.00*

	1x10 In. x 16 Ft. and Under			2x10 In. x 16 Ft. T. & Gr.	
	Pine	Fir	Hemlock	Pine	Fir
Atlanta	$55.00	.....	.....	$40.00	.....
Baltimore	55.00	$44.50	$44.00	.....	.....
Birmingham	36.00	.....	.....	45.00	.....
Boston	46.00	40.00	42.00	48.00	$45.00
Cincinnati	45.00	47.50	.....	35.00	45.00
Cleveland	60.00	48.00	.....	45.00	58.00
Dallas	60.00	.....	.....	55.00	.....
Denver	.....	38.00	38.50	.....	44.00
Detroit	48.00	44.00	.....	48.50	46.50
Kansas City	*46.00*	*33.25*	.....	**40.25**	*36.25*
Los Angeles	.....	38.50	.....	.....	53.50
Minneapolis	65.00*	40.00	.....	45.00*	39.00
Montreal	56.00	.....	.....	.....	.....
New Orleans	**60.00**	**50.00**	.....	59.00	*£.00*
Philadelphia	52.00	43.00	41.00	55.00	44.00
Pittsburgh	**75.00**	**55.00**	**55.00**	**65.00**	65.00
St. Louis	44.00	42.00	41.00	*45.00*	*42.00*
Seattle	.....	18.00	.....	.....	**19.00**

*Northern P.ne, No. 2 Com.

PILES—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Barge	Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.14½	$0.18
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	.19	.23
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	.21½	.25
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	.25½	.36
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	.27½	.31
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	.33	.41
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	.38	.45

Unit Prices From Current Construction Bids

Water Improvements for Meeker, Colo.

WATER improvements for Meeker, Colo., consisting of replacements and extensions to the existing water-supply flow line, the construction of accompanying structures, a water-distribution system and a 500,000-gal. steel tank, are being supervised by Black & Veatch, consulting engineers, under four contracts. J. F. Spotts Construction Co., Loveland, Colo., was awarded the general contract in July, 1930. Unit prices of the three sections of the general contract are listed herewith. Items 1 and 2 of Sec. 1 are for laying cast-iron and steel flow line, including hauling pipe from Rifle, Colo., and complete installation except welding joints. Minimum depth of cover is 2 ft. Sec. 2 includes (1) laying 4- to 8-in. cast-iron distributing pipe with 5-ft. cover, (2) laying 2-in. galvanized steel pipe, (3) taking up and relaying 2-in. steel pipe, (4) installing nineteen hydrants, (5) constructing three valve manholes, (6) placing foundations for the storage tank, and (7) furnishing and installing an altitude valve. Sec. 3 is for furnishing and making water service connections.

The flow line will be of cast iron with lead joints, but bids were asked also on steel with welded joints. Distribution piping will be of cast iron with lead joints. Trenches are of a depth necessary in order to obtain the specified cover, and widths are at least 12 in. greater than the external diameter of pipe. There are two river crossings, of welded steel pipe, one 8-in. and 100 ft. long; the other 12-in. and 150 ft. long. Excavation for bulkheads and the overflow structure is included in the price for concrete, and excavation is also included in the price for valve manholes. For other structures excavation is paid for separately. Class B concrete (1:2:4) is used for all structures in Sec. 1, and is tremie placed.

The lowest three bidders on the general contract are: A, J. F. Spotts Construction Co., Loveland; B, Stearns-Roger Mfg. Co., Denver; C, Schwartz Construction Co., Colorado Springs.

Proposal A	A	B	Avg. Low 3	Eng. Est.
27,000 cu.yd. tunnel excav.	$8.38	$9.00	$9.06	$10.00
9,500 cu.yd. tunnel conc.	14.00	24.00	19.00	15.00
82,000 lb. reinf. bars in tunnel	.04	.06	.053	.06
67,000 sq.ft. vitr. clay liner plates in tunnel	.20	.20	.23	.25
1,850 grout pipes	.50	.25	.58	1.50
3,700 bbl. grout	3.00	3.50	4.17	6.00
150 lin.ft. alignment holes	6.00	2.00	4.67	6.00
Total	$393,865	$505,833		
Proposal B				
23,500 cu.yd. tunnel excav.	8.49	9.00	9.09	10.00
8,300 cu.yd. tunnel conc.	14.00	24.00	9.00	15.00
50,000 lb. reinf. bars in tunnel	.04	.06	.053	.06
57,200 sq.ft. liner plates in tunnel	.20	.20	.23	.25
1,570 grout pipes	.50	.25	.58	1.50
3,200 bbl. grout	3.00	3.50	4.17	6.00
130 lin.ft. alignment holes	6.00	2.00	4.67	6.00
Cleaning up (lump sum)	3,000.00	2,500.00	2,500.00	2,500.00
Total	$344,920	$439,733		
Items Common to Proposals A and B				
16,500 cu.yd. open trench excav.	5.62	2.00	3.87	2.00
3,100 cu.yd. conc. for sewers and structures	21.25	20.00	19.08	15.00
20 cu.yd. common brick masonry	20.00	20.00	26.67	25.00
320,000 lb. reinf. bars in sewers and structures	.04	.04	.04	.05
33,000 sq.ft. liner plates in sewers and structures	.20	.16	.22	.20
3,600 sq.ft. vit. paving brick masonry	.20	.30	.33	.30
1,000 lb. sidewalk frames and covers	.08	.20	.18	.10
32,000 lb. miscellaneous c.-i. and steel	.13	.20	.16	.15
40 sq.ft. conc. cover plates	2.50	3.00	2.67	5.00
Totals	$203,435	$163,060		
Grand totals A	$597,300	$668,893	$627,645	
Grand totals B	548,355	602,793	565,485	

SECTION I—FLOW LINE

Laying steel pipe Pipe	A	B	C
(1) 12 ¾ inch O.D. 1,350 lin.ft.	$0.31	$0.52	$0.60
(2) 10 ¾ inch O.D. 3,450 lin.ft.	.24	.45	.53
(3) 8⅝ inch O.D. 13,570 lin.ft.	.23	.40	.47
Welded pipe joints			
(1) 12 ¾ inch O.D. 90	3.00	3.86	3.00
(2) 10 ¾ inch O.D. 100	2.60	2.94	2.50
(3) 8⅝ inch O.D. 800	1.25	2.86	2.25
Dresser coupling comp.			
(1) 12 ¾ inch O.D. 28	15.43	17.10	15.12
(2) 10 ¾ inch O.D. 10	11.00		12.63
(3) 8 ⅝ inch O.D. 12	9.05		10.22
Laying C. I. pipe:			
12 inch C. I. pipe			
(1) 16 ft. lengths 1,350 lin. ft.	.61	.665	.81
(2) 12 ft. lengths	.68	.685	.87
10 inch C. I. pipe			
(1) 16 ft. lengths 3,450 lin.ft.	.47	.57	.71
(2) 12 ft. lengths	.54	.59	.75
8 inch C. I. pipe:			
(1) 16 ft. lengths 13,570 lin.ft.	.40	.50	.57
(2) 12 ft. lengths	.47	.52	.60
4 inch C.I. pipe in blow-off line	.28	.42	.50
Total—Steel pipe	7,365.04	11,492.10	12,038.70
Total—C.I. pipe, 16 ft.	7,889.80	9,674.45	11,307.90
Total—C.I. pipe, 12 ft.	9,175.70	10,041.85	11,934.00
Welding joints for river crossing complete:			
(1) 12 inch, 20	3.00	3.86	5.00
(2) 8 inch, 14	2.25	2.86	3.00
River clamps complete:			
(1) 12 inch clamps min. weight 900 lb., 8	100	80.00	98.30
(2) 8 inch clamps min. weight 500 lb., 4	70	50.00	57.10
Total Item III	2,611.50	1,622.64	5,476.80
Intake:			
Excav. for intake structure, 70 cu.yd.	1.00	1.18	2.00
Constr. complete of intake structure, Cl. "B" reinf. con., 20 cu.yd.	41.40	41.00	45.00
Total Item IV	898.00	902.60	1,040
Settling tank:			
Excav. for settling tank, 20 cu.yd.	1.00	.95	1.00
Constr. complete of settling tank and chlorine house substructure, Class "B", 105 cu.yd.	39.40	41.00	49.00
Total Item V	4,657.00	4,549.00	1,040.00
Overflow structure and bulkhead:			
Constr. complete class B con., 10 cu.yd	40.65	41.00	40.00
Constr. complete 15 inch drain line:			
(1) Double strength vit. clay sewer pipe, 100 lin.ft.	2.00	1.50	2.00

SECTION II—WATER DISTRIBUTION SYSTEM

Laying C I. pipe:			
16 ft. lengths of pipe:			
(1) 8 inch, 7,500 lin.ft.	.37	.50	.49
(2) 6 inch, 6,700 lin.ft.	.28	.45	.38
(3) 4 inch, 14, 600 lin.ft.	.21	.40	.30
12 ft. lengths of pipe:			
(1) 8 inch, 7,500 lin.ft.	.38	.52	.52
(2) 6 inch, 6,700 lin.ft.	.30	.47	.40
(3) 4 inch, 14,600 lin.ft.	.23	.42	.32
2 inch Steel pipe lines constructed complete, 4,000 lin.ft.	.40	.48	.45
Taking up and relaying existing pipe:			
Excav. and removing 2 inch steel pipe 3,800 lin.ft.	.14	.20	.20
Amount to be deducted as a credit for excav. when new pipe is installed, 3,800 lin.ft.	.06	.10	.10
Relay old 2 inch steel pipe in new trench, 1,000 lin.ft.	.14	.32	.35
Install hydrants:			
Install hydrants complete, 19	14.00	10.00	18.00
Valve manholes:			
Constr. complete valve manholes, 3	100	100	75.00
Foundation for storage tank:			
Excavation complete, 150 cu.yd.	.80	.80	1.00
Constr. complete of all conc. work, Cl B conc., 90 cu.yd.	30.00	30.00	25.00
Reinf. steel for foundation, 5,000 lb.	.07	.07	.07
Altitude valve:			
Furnish and install complete 8 inch Golden-Anderson valve, 1	423.00	375.00	384.00
Total—Section II—16 ft. pipe	14,148.09	19,640.00	17,212.00
Total—Section II—12 ft. pipe	14,694.00	20,216.00	17,863.00

SECTION III—WATER SERVICE CONNECTIONS

Service line extensions:			
¾ inch galv. W.S. pipe installed complete, 2,000 lin.ft.	.30	.35	.40
1 inch galv. W.S. pipe installed complete, 500 lin.ft.	.34	.38	.45
Corporation cocks:			
¾ inch installed complete, 200	3.87	2.93	4.00
2 inch installed complete, 30	4.30	3.31	4.25
1 inch installed complete, 20	5.50	4.41	5.00
Lead gooseknecks:			
¾ inch installed complete, 200	Included in Item II	.48	2.50
2 inch installed complete, 30		.50	3.00
1 inch installed complete, 20		.65	3.25
Total Section III	1,783.00	1,771.50	2,707.50
Totals—no deduction made for Item (b) Section II			
(1) Based on steel flow line and cast-iron pipe, 16 ft. lengths, distribution system	34,576.34	43,637.84	47,120.00
(2) Same as (1)—12 ft. length cast-iron pipe in distribution system	35,077.34	44,213.84	47,771.00
(3) Based on cast-iron pipe flow line,			

Unit Prices From Current Construction Bids

	A	B	C
18 ft. lengths, and 16 ft. length cast-iron pipe in distribution system...	35,101.10	41,820.19	46,389.20
(4) Same as (3) with 12 ft. length cast-iron pipe in distribution system....	35,602.10	*42,396.19	47,040.20
(5) Based on cast-iron pipe flow line, 12 ft. lengths, and 16 ft. length cast-iron pipe in distribution system....	36,387.00	42,187.59	47,015.30
(6) Same as (5) with 12 ft. lengths cast-iron pipe in distribution system....	36,888.00	42,763.59	47,666.30
Time of completion.....	4 months	3½ months	130 wkg. days

Dredging in East River, New York

IN THE west channel of the East River between 54th and 86th Sts., Manhattan, the bottom will be dredged to a level 35 ft. below m.l.w. Work is laid out in four sections having areas of (1) 590x100 ft.; (2) 1,590x50; (3) 425x70; (4) 4,785x175. Material consists of 82,705 cu.yd. of Manhattan schist with some Fordham gneiss and quartz, 24,150 cu.yd. hardpan and sand. Contract was awarded in September, 1930, to the Arundel Corp., Pier 2, Pratt St., Baltimore, for $5.49 and $0.90, a low total bid of $475,785. Complete unit prices are given herewith.

REMOVING ROCK AND HARDPAN IN EAST RIVER, N. Y.

	Ledge Rock	Other Material	Total Bid
Arundel, Baltimore.....	$5.49	$0.90	$475,785
Great Lakes Dredge & Dock, N.Y.C.....	4.47	4.47	477,642
Eugene Breymann, N.Y.C.....	6.77	6.77	559,913
White, Heinzerling & Moore, N.Y.C.....	8.00	8.00	854,840
United Dredging, N.Y.C.....	.98	12.20	1,032,668
Bridgeport Dredge & Dock.....	1.00	12.50	1,057,96?

The East River is a tidal strait 16 miles long, connecting the Hudson River at the Battery with Long Island Sound at Throggs Neck. Ice may be expected at intervals from Jan. 1 to Feb. 28, and fog averages 24 days per year. Tidal current is 4.9 to 5.2 miles per hour. Bridge clearances are at least 135 ft. There are two rapid-transit tunnels at 53d and 60th Sts. and a gas tunnel at 71st St., and blasting extends to 250 and 700 ft. respectively from the first two tunnels and ledge rock will be removed over the 71st St. tunnel. Disposal is 2 miles from the site.

This contract is part of a project for which $21,516,000 has been appropriated and $18,483,950 is yet to be provided. The table shows that three of the six contractors submitted a flat bid covering any kind of material encountered and three submitted separate unit bids on ledge rock and other material. The principle of bidding on this kind of a job is that if the quantity of each class of material is fairly definitely known it is better to bid on each separately; but if there is an uncertainty as to the quantity of either material, a flat rate is a greater safeguard against loss.

The lowest two bidders, both excellently equipped for the work, were only $1,857 apart on a low bid of $475,785. Great Lakes Dredge & Dock Co. bid $4.47 flat, Arundel, $5.40 and $0.90.

One contractor states that "the ability to make the low bid is all in the equipment." Another says: "Accurate knowledge of the physical condition of a project, carefully worked out figures in bidding on rock, and thoroughly up-to-date equipment will keep a contractor from going broke on this kind of work." Another factor to be considered is sailor labor, mostly Scandinavians who, trained by the contractor, work as drill runners for $60 per month plus food, quarters and bonus, compared with $15 per day maximum for drilling ashore. The hazards include the possibility of encountering quartz or traprock, and delay from collisions with vessels. One of the contractors, bidding flat, recalled an instance where considerable hydraulic material (sand and mud) from another project drifted down the East River into this contractor's project and had to be removed at his expense. The principal problem is in drilling, blasting and removing rock.

Discussing high prices, one of the contractors said: "It is an understood thing that very high prices are likely to be merely complimentary," explaining that the high bidders may be seeking to tie up competitors' equipment so that there will be fewer bidders on future attractive projects. This is particularly true of submarine rock-blasting because of the limited number of firms equipped for the work.

Shore Protection on Tybee Island, Ga.

BIDS were received on Aug. 29, 1930, for protection works on the east shore of Fort Screven reservation on Tybee Island, Ga., for either steel sheetpiles or creosoted wood piles. Contract was awarded for steel construction to the MacDougald Construction Co., Atlanta, for $83,771.

The site is reached by a branch of the Central of Georgia R.R. Water for drinking and boilers is available; but water for jetting, if needed, must be pumped from the ocean. Driving may be by hammer or jet, or both. Mean tidal range is 6.9 ft., and site is exposed to storms on three sides. Material is sand with perhaps some wreckage and logs.

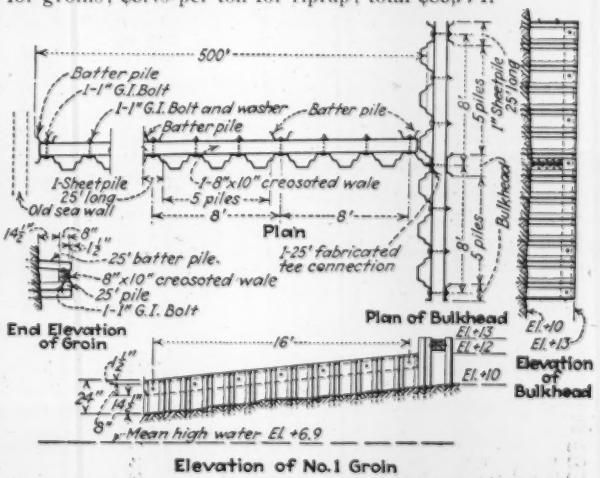
The work consists of a longitudinal bulkhead 2,650 ft. long, with five groins totaling 1,790 ft. extending from it to an old concrete seawall parallel to the beach. The ocean side of the bulkhead at the southerly end will be protected from wave action for 200 ft. by placing 1,000 tons of riprap. This may be solid rock or broken concrete, or both, with smallest dimension not less than one-third the largest and weighing 100 to 300 lb. Both bulkhead and groins will be of steel sheetpiles supported at the top by a single line of 8x10-in. creosoted wood waling, both being bolted to steel batter piles spaced 8 ft. and sloped 5 on 1.

Top of bulkhead will be 13 ft. above m.l.w.; groins 12 ft. above at bulkhead and 0 to 2 ft. offshore. Sheetpiles are 15 ft. long in bulkhead and 14 ft. in groins, with a 25-ft. pile driven every 8 ft. in both types of structure. Opposite this long pile a steel batter pile the same length is driven and bolted to waling and sheetpiles with 1-in. galvanized bolts.

Work proceeds as follows: (1) 1,000 ft. of bulkhead from south; (2) riprap protection; (3) groin 1; (4) 660 ft. bulkhead between groins 2 and 3; (5) groin 2; (6) 570 ft. bulkhead between groins 3 and 4; (7) groins 3 and 4; (8) remaining 420 ft. bulkhead; (9) groin 5.

Estimated quantities of materials are 1,150 tons sheetpiling; 32,600 ft.b.m. 8x10-in. creosoted timber; 6,100 lb. galvanized-iron nuts and bolts; 1,800 lb. cast-iron washers; 1,000 tons riprap.

Contract unit prices are $17.90 per linear foot for steel piling for bulkhead; $18.40 per linear foot for steel piling for groins; $3.40 per ton for riprap; total $83,771.



CONSTRUCTION OF STEEL SHEETPILE BULKHEAD

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Bridges			
Omaha	Bridges	2,600,000	Proposed
Factories and Mills			
Hamilton (Ont.)	Compressor, plant, etc.	1,000,000	Proposed
Hamilton (Ont.)	Plant	1,000,000	Proposed
Warehouses			
New York	Warehouse	1,500,000	Bids asked
Buildings			
Yonkers	Bank	1,000,000	Contract
Pittsburgh	Bank	1,000,000	Contract
Oklahoma City	Bank	3,000,000	Contract
New York	Home	1,000,000	Bids asked
St. Louis	Hospital, etc.	1,000,000	Bids asked
Dayton	Hospital	1,118,000	Contract
Sioux City	Medical Arts	1,500,000	Contract
St. Louis	Merchandising Mart	5,000,000	Bids asked
Newark (N. J.)	Office	8,500,000	Contract
Washington (D. C.)	Office	3,000,000	Proposed
Boston	Office	1,000,000	Proposed
New York	Office	2,000,000	Contract
New York	Office	5,000,000	Bids asked

WATERWORKS

PROPOSED WORK

Minn., Breckenridge—City purchasing 500 water meters. R. R. Waite, city clk.

Minn., Duluth — E. W. Kelly, engr., City Hall, bids in November, force main for city's water supply, $15,000; constructing additional projects, total $45,000-$50,000, for City.

N. J., Margate City—Bd. City Comrs., City Hall, extending waterworks, $15,000. E. D. Rightmire, city engr. Noted Oct. 23.

N. Y., Glens Falls — Dpt. P. Wks., E. L. H. Meyer, supt. Water Dpt., soon takes bids hydraulic water pumps.

Pa., York—York Water Co., bids early in spring, 20 m.g. filtration plant. Gemmel & Bellmeyer, Risemiller Bldg., archts. Fuller & McClintock, Penna Bldg., Phila., engrs.

S. D., Rapid City—Waterworks improvements, incl. large intake pipes to top natural springs, 260,000 gal. reservoir, $215,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., engrs.

Tex., Marble Falls—R. Goeth, Marble Falls, and Austin, purchased privately owned waterworks plant and plans improving, extending mains, incl. pumping equipment, fire hydrants, etc.

Ont., Preston—Preston Water Comn., F. O. Pelz, chn., new pipe line, underground storage reservoir. $60,000. James, Proctor & Redfern, 36 Toronto St., Toronto, engrs.

Ont., Whitby—Town Council, 2.5 to 3 mi. 12 in. c.i. main in earthwork excav., from Lake Ontario to town. $40,000. H. L. Pringle, Whitby, engr.

BIDS ASKED

Calif., Beverly Hills—Nov. 12, by City Council, rein.-con. sediment basin, mixing tanks and clarifier for Water Treatment Plant 2, $25,000 or more.

N. Y., New York—Nov. 14, by J. J. Dietz, comr., Water Supply, Gas and Electricity, Municipal Bldg., low pressure mains, removing, relaying high pressure mains in Union Square W., Old and New City Hall Pls., 5th and 8th Aves., Church, Pearl and East 70th Sts.

N. D., Bismarck—Nov. 10, by Bd. City Comrs., A. P. Lenhart, pres., 24 lin.ft. 6 in. c.i. main in 8th St., Dist. 26; 26 lin.ft. 6 in. main 5th St., Dist. 25. M. H. Atkinson, city aud.

Pa., Phila.—Nov. 19, by Dpt. P. Wks., Bureau of Water, A. Murdock, dir., City Hall Annext, Contr. 1000, furnishing, laying 6, 8 and 12 in. pipe, Manayunk, 150 tons Class B c.i. pipe, 10 tons 12 in. smaller c.i. specials, twelve 6 in., twelve 8 in. and five 12 in. stop valves, 12 fire hydrants; Contr. 1005, furnishing, installing railroad siding at Lardners Point; Contr. 1006, furnishing, laying 6, 8 and 12 in. straight c.i. pipe, 1,125 tons pipe, 100 tons 6, 8 and 12 in. c.i. specials, one hundred 6 in., one hundred 8 in. and twenty 12 in. stop valves, 100 fire hydrants; Contr. 1008, furnishing and delivering 500 Philadelphia Standard fire hydrants, 500 each flange removable pipe rapid service fire hydrants and service hydrant tops; Contr. 1010, furnishing and delivering 150 tons 8 in. straight c.i. pipe, 6 tons 8 in. short length sleeves-nipples, 4 tons 8 in. bends and reducers, 4 tons 8 in. crosses and tees, 18 high pressure stop valves, Universal or flanged and 4 tons 8 in. flanged cross tees; Contr. 1011, laying high pressure pipe.

CONTRACTS AWARDED

Calif., El Centro—Furnishing 3,000 ft. 4 in. and 4,000 ft. 6 in. c.i. pipe, to Pacific States Cast Iron Pipe Co., 417 South Hill St., Los Angeles, $4,047.

Mass., Pittsfield — Extending mains in New Lennox. $20,000. City builds, to relieve unemployment.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, remodeling Pumping Station 3, to L. Levine, 305 Bway., New York, $25,850. Noted Oct. 16.

SEWERS

PROPOSED WORK

Kan., Topeka—Soon takes bids 5,000 ft. 8 and 10 in. sewers, Sewer Dist. 92. W. E. Baldry, City Hall, engr.

N. J., Irvington — Township Comn., Town Hall, preliminary plans 24 mi. sewers and sewage treatment plant, $650,000. T. F. Bowe, 110 Williams St., New York, consult. engr. W. S. Logan, twp. engr. This corrects report in Oct. 23 issue. Noted Oct. 23.

N. J., Ventnor — Joint Bd. City Council, Margate City, revised preliminary plans joint sewage treatment plant, at Shelter Island, $400,000. E. D. Rightmire, 530 Guarantee Trust Bldg., Atlantic City, engr. Noted Apr. 3.

Ont., Kingston—City expending $96,000, sewerage work and highway construction.

Ont., Mt. Forest—City Council, sewers, disposal plant. $85,000. A. Cotton, Town Hall, engr.

BIDS ASKED

Kan., Topeka—Nov. 12, by City, City Hall, 2,000 ft. 8 and 9 ft. storm sewers built of rein.-con. pipe, monolithic rein.-con., brick arch, concrete base, sidewalls, segmental block constr., between Kansas River, 2nd and Polk Sts. Trench excav. being 8 ft., trench backfilling to be done by hand labor. W. E. Baldry, City Hall, engr.

La., New Orleans—Dec. 30, by Sewerage & Water Bd., at office A. G. Moffat, secy., 526 Carondelet St., Contr. 118-D, extending Drainage Pumping Station 7. G. O. Earl, genl. supt.; adv. E. N.-R. Nov. 6.

Mass., Boston — Nov. 7, by Dpt. P. Wks., sewerage works, Hyde Park; Nov. 12, in West Roxbury; Nov. 14, in Dorchester. $25,000. A. J. Rourke, comr.

Mich., Detroit—Nov. 12, by Dpt. P. Wks., Puritan-Telegraph Pumping Station and outlet sewer in Puritan Ave., and Rouge River, 1,218 ft. 20 in. vitr. and 66 ft. 14 in. c.i. sewer, pump well, pump house, manholes, two 8 in. pumps to have combined capacity of 2,700 g.p.m. against total dynamic head of 8 to 22 ft. P. A. Fellows, City Hall, engr.

N. J., Ocean City — Nov. 10, by Bd. City Comrs., City Hall, sanitary sewers from 17th to 36th Sts, from Bay Ave. to Ocean front, $250,000. W. H. Collisson, Jr., city engr.

N. Y., Hudson—Nov. 20, by Comn. P. Wks., City Hall, sanitary, storm and outfall sewers, appurtenances. J. McClure Wardle, city engr. T. F. Bowe, 110 William St., New York, consult. engr. Noted Oct. 23.

N. Y., Long Island City—Nov. 10, by G. U. Harvey, pres. Queens Boro. Queens Subway Bldg., sewers in Arlington Terrace, 53rd Rd., 40th, 67th, 197th Sts., Edsall, Cooper, Metropolitan, 107th, 108th, Hiawatha Aves.

N. Y., Syracuse — Nov. 10, by New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, sanitary sewers in Peat Street Yards, for City and Grade Crossing Comn. N. F. Pitts, Jr., city engr. Noted Oct. 16.

Wash., Seattle—Bd. P. Wks., City Hall, bids about Jan. 1, Charleston St., et al., unit of Lake Washington Intercepting Sewerage System, which will eventually divert all sewage from Lake Washington by pumping it to Puget Sound, incl. 3 pumping stations, triple strength vitr. pipe, $200,000. R. H. Thomson, Seaboard Bldg., engr.

Ont., Stratford—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewerage works, Sect. 11, Stony Brook, West Roxbury and Roslindale, to V. Barletta, 8 Whipple Ave., Jamaica Plain, $141,670; in West St., to C. Struzziery, 115 Kittredge St., Roslindale, $20,301 est. $25,000. Noted Oct. 9.

N. Y., Attica—Dpt. Correction, State Office Bldg., Albany, sewage disposal plant, outfall sewer, to W. J. Gallagher, Medina, $91,045. Noted Oct. 16.

O., Cleveland — For 2,375 ft. No. 7, brick tile intercepting sewer connection in East 40th St., to A. L. Connelly Co., 1900 Euclid Bldg., $84,350.

Okla., Tulsa — City Comrs., Storm Sewer 9-F-30, to Fike & Frye, 2531 East Independence St., $46,335. Est. $82,888. Noted Sept. 18.

Wash., Seattle—City Comn., clay sewers, to T. Scalzo, 1708 22nd Ave. S., $93,866. Est. $100,000. Noted Oct. 2.

Ont., Stratford—City Council, sewers, watermains, day labor, under supervision A. Riehl, city engr. $82,000.

WASTE DISPOSAL

BIDS ASKED

O., Lakewood — Nov. 10, by City, E. A. Wiegand, mayor, 1 story, brick, concrete, steel, garbage incinerator, Berea Rd. $110,000. E. Fisher, City Hall, archt.

BRIDGES

PROPOSED WORK

Calif., Santa Monica — Surveys viaduct between Santa Monica Canyon and Palisades at Marguerita Ave. $800,000. H. B. Carter, city engr.

N. J., Caldwell—Bd. Freeholders Essex Co., Hall of Records Bldg., Newark, timber bridge, on Western Essex Hy. $25,000. W. H. Stickel, Hall of Records Bldg., Newark, co. engr.

BIDS ASKED

California—Nov. 12, at office C. H. Purcell, engr. State Hy. Dpt., Sacramento, twelve 19 ft. span bridge, four 19 ft. span bridge, 2 two 19 ft. span bridges, 21 mi. west of Wasco, Kern Co.

Florida — Nov. 10, by State Road Dpt., Tallahassee (F.A.P. means Federal Aid Project), bridge to have four 40 ft. rein.-con. deck girder spans on concrete piers. F.A.P. 71, Road 4, Brevard Co.; concrete paving 9.92 mi. F.A.P. 73-D, Road 17, Polk Co. B. M. Duncan, state hy. engr.

See proposal advertising on page 138

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LEADITE

Laying 72-in. C. I. Bell and Spigot Pipe with LEADITE Joints.

LEADITE makes a good, tight Joint on "all sizes" of bell and spigot pipe

—In fact, water mains from 4-in. to 84-in. diameter (inclusive) have been successfully jointed with LEADITE. What's more, LEADITE has been used on water lines constructed under many adverse conditions, such as: Under modernly paved streets; Under Railroad Tracks; Suspended from bridges; Around sharp bends; Under river beds; Across swamps; Up hill and Down hill, etc.—where the going is easy or where the going is hard.

Regardless of the size of the pipe or working pressure, LEADITE joints "hold tight."

Waterworks men most everywhere specify and use LEADITE for the "one paramount reason;" namely, LEADITE is (and always has been) a Quality Product, and gives results.

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building - - - Philadelphia, Pa.

No Caulking

Bridges (Continued)

Ind., Michigan City—Bd. Comrs. Laporte Co., Laporte, taking bids Franklin St. Bridge, rein.-con. $200,000. Scherzer Co., 50 West Jackson Blvd., Chicago, Ill., engr. Noted July 30.

Iowa—Nov. 11, by State Hy. Comn., Ames, 90 x 20 ft. pony truss bridge with two 40 x 20 ft. I-beam approaches, 12 culverts, extensions, Rds. 14 and 58, F.A.B. 19—31 culverts, extensions, Rd. 58, F.A.B. 315 and 32 x 24 ft. I-beam bridge, 40 x 24 ft. I-beam bridge, 60 x 20 ft. pony truss bridge, 49 culverts, extensions, Rds. 14 and 57, both Grundy Co.—19 culverts, extensions, Rd. 58, F.A.B. 79 Hardin Co.—two 48 x 20 ft., span, one 24 x 20 ft. span and one 28 x 24 ft. span I-beam bridges, one 120 x 20 ft. high truss bridge with twelve 40 x 20 ft. I-beam approaches, extending 14 ft. slab bridge, 35 culverts, extensions, Rd. 73, B-129 Iowa Co.—160 x 20 ft. high truss bridge with four 40 x 20 ft. I-beam approach spans, 50 x 20 ft. pony truss bridge, Rd. 113, B-687 Jones Co.—7 culverts, extensions, Rd. 6, P-294 Monroe Co.—31 culverts, extensions, Rd. 58, F.A.B. 315 Grundy Co. C. R. Jones, aud.

Maryland—Nov. 14, by State Roads Comn., G. C. Uhl, chm., Baltimore single span rein.-con. girder bridge, approaches, Contr. B-161-43, Baltimore Co.; adv. E. N.-R. Nov. 6.

Massachusetts—Nov. 12, by Dpt. P. Wks., Boston, steel plate girder, steel stringer bridge, rein.-con. beam bridge, and rein.-con. and bituminous macadam approaches in Palmer and Monson. A. W. Dean, Dpt. P. Wks., Boston, engr.

N. Y., Brooklyn—Nov. 18, by A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, constructing Harway Avenue Bridge over Coney Island Creek, Brooklyn Boro.

Tennessee—Nov. 21, by State Dpt. Hys. & P. Wks., Nashville (**S.B.P. means Special Bridge Project, F.A.P. Federal Aid Project**), 0.25 mi. concrete, steel bridge over Cumberland River, near Gallatin, S.B.P. 20, Wilson and Sumner Counties—0.21 mi. concrete, steel bridge over Cumberland River, near Ft. Blount, S.B.P. 21, Jackson Co.—concrete, steel bridge over French Broad River, near Bridgeport, F.A.P. 216-B, Cocke Co.—concrete, steel bridge over Watauga River, between Johnson City and Bluff City, F.A.P. 224-D, Washington Co.—concrete, steel bridge over Caney Fork River, near Carthage, F.A.P. 229-A, Smith Co.—1 mi. approaches to bridge over Clinch River, near Kingston, S.A.P. 85-C, Roane Co.—grading, drainage structures 9 mi. State Hy. 9, F.A.P. 228-D, Jefferson Co. R. H. Baker, ch. hy. engr.

Virginia—Nov. 18, at office State Hy. Dpt., Richmond, bridge over James River, Route 17, Project 557 Botetourt Co.; adv. E. N.-R. Nov. 6.

Wash., Everett—Bd. Comrs. Snohomish Co., bids about Jan. 1 replacing wooden structure with steel girder concrete surface structure on Mukilteo Blvd. $60,000. R. D. Alverson, Everett, co. engr.

West Virginia — Nov. 25, by State Road Comn., Charleston, Vinson Street Bridge 1253, three 40 ft., five 50 ft. and one 62 ft. spans, concrete deck girder, concrete substructure, P. 3469, Mingo Co.—Guano Creek Bridge 1251, 20 ft. span concrete arch culvert, P. 3247, Putnam Co.—Davis Bridge 1213, concrete substructure, 2 abutments, 2 piers, P. 3454, Tucker Co. —grading, drainage structures 1.62 mi. Fairmont-Grafton Rd., P. 155-D, Marion Co.—20,000 lin.ft. wire rope guard rail, Routes 2, 22 and 30, Hancock Co.—125,000 lin.ft. wire rope guard rail Route 250, Marshall Co. G. E. Hite, secy.

CONTRACTS AWARDED

California—C. H. Purcell, ch. engr. State Hy. Comn., Sacramento, widening 5 concrete bridges on Vacaville-Dixon Rd., Solano Co., to G. J. Ulrich Constr. Co., Modesto, $11,463. Noted Sept. 25.

Iowa—State Hy. Comn., Ames, bridges, culverts in Cass Co., to A. Melberg, Cedar Rapids, $7,000—Cass Co., to Jensen Constr. Co., Kimballton, $8,543—Dallas Co., to Eno & Montgomery, Rockwell City, $29,491—Dallas Co., to J. W. Schroyer, Baxter, $1,990—Davis Co., to W. Denny, West Liberty, $5,430—Davis Co., to E. C. Ellis, Centerville, $2,400—Guthrie Co., to L. Peterson, Cedar Rapids, $10,782 — Pottawattamie Co., to B. L. Larson, Hampton, $1,200—F.A.B. 72 and B-7, Story Co., to Ben Cole & Son, Ames, $6,626 and $208 respectively, Grand total $73,670. Noted Oct. 23.

Kan., Clay Center—State Hy. Comn., Topeka, at Court House, Salina, two 90 ft. and three 140 ft. span bridge on Kansas Project 15, Clay Co., to Bateman Constr. Co., Nashville, Tenn., $70,435. Noted Oct. 9 under "Streets and Roads, Kansas."

Mass., Harwich—Dpt. P. Wks., Boston, A. W. Dean, engr., 650 ft. timber pile bridge with bitulithic concrete approaches, to Merritt, Chapman & Scott, 292 Pequot Ave., New London, Conn., $27,610. Noted Oct. 23.

Mo., Kansas City—Kansas City Terminal Ry. Co., Union Sta., J. V. Hanna, ch. engr., superstructure 1,200 ft. viaduct over Oak St., to McClintic & Marshall, 38 South Dearborn St., Chicago, Ill., $95,000. Total est $350,000. Noted Apr. 3.

N. J., Trenton—Bd. Freeholders Mercer Co., Court House, concrete bridge over Doctor's Creek, Yardville Rd., to E. H. Ellis, Westville, $34,662. Noted Oct. 23.

N. J., Union Beach—Bd. Freeholders Monmouth Co., Court House, Freehold, timber, steel bridge, on Jersey Ave., to T. Proctor, 212 North 5th St., Long Branch. Est. $25,000.

N. Y., Ticonderoga—Town, concrete slab span bridge over Four Mile Run Creek, to M. C. Grinnell, Ticonderoga, $24,000.

Tex., Fort Worth—Tarrant Co., c/o W. E. Yancey, aud., bridge steel girders, concrete approaches, Stove Foundry Rd., to Austin Bridge Co., 1813 Clarence St., Dallas, $57,760. Noted Oct. 9.

West Virginia—See "Streets and Roads."

STREETS AND ROADS

BIDS ASKED

Calif., Huntington Beach—Nov. 17, by City Council, 3- to 5½-in. rock and oil or emulsified asphalt paving 2 mi. Indianapolis, Wesley Sts., et al. M. Rossin, city engr.

Calif., San Diego—Nov. 17, by City Council, grading, curbing, sidewalks, 6 in. concrete paving 21,182 sq. yd. Eads St. H. W. Jorgensen, City Hall, engr.

Calif., Santa Ana—Nov. 12, by Bd. Comrs. Orange Co., improving Laguna Ave., incl. 11,500 lin.ft. grading, 5,400 tons asphaltic concrete paving, 1,600 cu.yd. gravel base and shoulders.

Indiana — Nov. 21, by State Hy. Comn., Indianapolis, (**P. means Project, F.A.P. Federal Aid Project**), concrete, bituminous concrete or brick surfacing 13.322 mi. Tipton-Alexandria Rd., State Rd. 28, F.A.P. 172-AB Tipton and Madison Counties—6.529 mi. Bloomfield-Bedford Rd., State Rd. 54, F.A.P. 161-A Greene Co.—3.282 mi. Gary-Michigan City Rd., State Rd. 20, P. 193-A Lake and Porter Counties—4.756 mi. Gary Michigan City Rd., State Rd. 20, P-193-B and 4.73 mi. same road, P. 193-C Porter Co.—11.107 mi. Roll-Bryant Rd., State Rd. 18, F.A.P. 220-A Blackford and Jay Counties—9.929 mi. Roll-Bryant Rd., State Rd. 18, F.A.P. 220-B Jay Co.—13.594 mi. Franklin-Indianapolis Rd., State Rds. 144 and 35, P. 226-B Johnson Co.—9.981 mi. Hatfield-Rockport Rd., State Rd. 66, F.A.P. 229 Spencer Co., State furnishes cement on above projects—grading, drainage structures 4.594 mi. Bloomfield-Bedford Rd., State Rd. 54, F.A.P. 161-B Greene and Lawrence Counties—grading 0.382 mi. approaches to New York Central R.R. subway at North Hayden, State Rd. 2, P. 138-A1 Lake Co. J. J. Brown, dir.

Ind., Evansville—Nov. 13, by Bd. Comrs. Vanderburgh Co., grading drainage structures, rock asphalt, 4 in. penetration course on 4 in. waterbound macadam paving 2,685 ft. Summit Dr., 19 ft. $40.885. R. W. Meisinger, Court House, engr.

Iowa—Nov. 11, by State Hy. Comn., Ames, (**P. means Project and F.A.P. Federal Aid Project**), grading, drainage structures, flumes, paving 20,638 sq.yd. Rd. 3, P. 674 Appanoose Co.—50,947 sq.yd. Rd. 16, P. 684 Dallas Co.—42,013 sq.yd. Rd. 3, F.A.P. 153 same road—114,976 sq.yd. Rd. 63, F.A.P. 209, both Davis Co.—130,379 sq.yd. Rd. 7, F.A.P. 51 Guthrie Co.—120,298 sq.yd. Rd. 58, F.A.P. 79, Hardin Co.—1,349 sq.yd. F.A.P. 96, Linn Co.—gravel surfacing 11.57 mi. Rd. 13, P. 594 Allamakee Co.—4.034 mi. Rd. 14, P. 71 Butler Co.—175 cu.yd. riprap, C. R. Jones, aud.

Kansas — Nov. 14, by State Hy. Comn., Topeka, at Court House, Hill City, grading, culverts 10.271 mi. U. S. Hy. 40-N, Federal Aid Project 318-G, Graham Co. W. V. Buck, ch. engr.

Kansas — Nov. 12, by State Hy. Comn., Topeka, at Court House, Hill City, improving Federal Aid Project 318-G, Graham Co. W. V. Buck, ch. hy. engr.

Kentucky — Nov. 12, by State Hy. Dpt., Frankfort, grading, drainage structures, bridges, approaches 0.133 mi. Beardstown-Lawrenceburg Rd., State Aid Project 18-A-B, Nelson Co. B. Johnson, chn.

Kentucky — Nov. 26, by State Hy. Dpt., Frankfort, (**F.A.P. means Federal Aid Project and S.A.P. State Aid Project**), grading, drainage structures 13.9 mi. Shepherdsville-Taylorsville Rd., S.A.P. 46-CG Bullitt Co.—9.5 mi. Hopkinsville - LaFayette Rd., S.A.P. 10 - AG Christian Co. — 5.7 mi. Flemingsburg-Carlisle Rd., S.A.P. 43-BG Fleming Co.—4.3 mi. Litchfield-Hardinsburg Rd., S.A.P. 138-A.G. Grayson Co.—3.4 mi. Horse Cave-Bear Wallow Rd., F.A.P. 192-AG Hart Co.—2.7 mi. Tiptop-Grahampton Rd., F.A.P. 293-AG Meade Co.—3.3 mi. Tompkinsville-Meshack Rd., S.A.P. 40-BG Monroe Co.—5.4 mi. Hartford-Fordsville Rd., S.A.P. 45-EG Ohio Co.—15.6 mi. Owenton-Frankfort Rd., F.A.P. 221-AG Owen Co.—3.9 mi. Springfield-Perryville Rd., F.A.P. 220-AG Washington Co.—surfacing 9.6 mi. Clinton-Columbus Rd., S.P. 7-ES Hickman Co.—100 ft. steel span bridge with concrete floor over O'Bien River on Clinton-Columbus Rd., S.A.P. 7-EB Hickman Co.—3 rein.-con. deck girder bridges, 1 two 30 ft. spans, 1 six 30 ft. spans, other three 30 ft. spans, extending 2 culverts, grading necessary to raise fill across O'Bien Creek bottom, S.A.P. 7-EG Hickman Co.—four 45 ft. rein.-con. deck girder spans with rein.-con. piers, abutments, 4 x 4 rein.-con. box culverts, 0.25 mi. approaches over Cartwright Creek on Springfield-Bardstown Rd., F.A.P. 222-AB Washington Co. B. Johnson, chn.

Louisiana — Nov. 25, by State Hy. Comn., Baton Rouge, improving roads in Richland, St. John the Baptist, St. Charles, Desoto, Livingston, Bienville, Bossier, East Carroll, Terrebonne, Lafourche, Natchitoches, Grant, Winn, East Baton Rouge, Caldwell, Orleans Parishes; bridges in Jefferson, Allen, Beauregard, Catahoula, Franklin and Tensas Parishes. H. B. Henderlite, hy. engr.; adv. E. N.-R. Nov. 6.

Maryland—Nov. 12, by State Roads Comn., Baltimore, 0.6 mi. concrete sidewalks in Prince George's Co. L. H. Steuart, secy.; adv. E. N.-R. Nov. 6.

Massachusetts — Nov. 12, by Dpt. P. Wks., Boston, gravel and bituminous macadam paving 3,850 ft. by Millis. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Melrose—See "Contracts Awarded."

N. J., Jersey City—Nov. 10, by Port of New York Authority, 80-90 8th Ave., New York, maintenance of New Jersey Plaza of Holland Tunnel during ensuing year incl. grading, curbing, paving, concrete sidewalks. $25,000. Private plans.

N. J., North Haledon—Nov. 7, by Bd. Boro Council, School House, Squaw Brook Rd., bituminous penetration macadam paving Graham Ave. $25,000. F. J. Wright, 45 Church St., Paterson, boro engr.

New York—Nov. 18, by A. W. Brandt, comr. Hys., Albany, improving hys. in Orange and Tompkins Counties; reconstructing hys. in Herkimer, Montgomery, Rockland, Ulster and Westchester Counties; adv. E. N.-R. Nov. 6.

N. Y., Harrison—Nov. 12, by C. MacDonald, engr. Westchester Co., Court House, White Plains, granite curbing, concrete sidewalks, rein.-con. bridge on Halstead Ave., County Rd. 80A; adv. E. N.-R. Nov. 6.

N. Y., Mount Pleasant—Nov. 19, by Westchester Co. Park Comn., 72 West Postfield Rd., Bronxville, 3 stone-faced rein.-con., structural steel bridges on Saw Mill River Parkway, south of here. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Nov. 6.

N. Y., New York—Nov. 12, by A. Goldman, comr. Plant & Structures, Municipal Bldg., regrading, repaving East 58th St. between 1st and 2nd Aves.

N. Y., New York—Nov. 13, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading, curbing, sidewalks on Cannon Pl., Radcliffe, and Storey Aves., Oakley, West 236th, East 213th Sts.

N. Y., St. George—Nov. 12, by J. A. Lynch, pres. Richmond Boro, Boro Hall, granite block, (2nd hand) paving wings Hylan Blvd.; constructing wing walls, grading Ridgewood Ave.

Tennessee—See "Bridges."

Tex., Amarillo—Nov. 11, by E. N. Stanley, engr., City Hall, concrete curbing, guttering, 6 in. limestone base paving 15,000 sq.yd. Country Club addition, portion of 6th and Line Aves.

Tex., Dallas—Nov. 13, by Dallas Co., C. E. Gross, aud., double course asphalt surface treating 1 mi. road in Dist. 2.

CONTRACTS AWARDED

California — State Hy. Comn., Sacramento, Oct. 22, grading, asphaltic concrete paving 13.1 mi. Arroyo-Salado Rd., Imperial Co., to Hazard Contg. Co., 2508 Kettner Blvd., San Diego, $489,125. Noted Oct. 8.

Ill., Chicago—Cook Co., County Bldg., grading, paving 37,368 sq.yd. Crawford Ave. and 6,868 sq.yd. Devon Ave., to Arcole Constr. Co., Evanston, $75,388 and $11,454 respectively—21,941 sq.yd. McHenry Rd., to E. A. Meyer Constr. Co., Highland Park, $50,229—491 sq.yd. 111th St., to Pronzer Bros., Blue Island, $2,054—131st St. and Palatine Rd., to T. McQueen, Maywood, $16,066 and $49,136 respectively—grade separation over Chicago & Northwestern R.R. on Waukegan Rd., to Acme Eng. Co., 20 North Wacker Dr., $82,164. Grand total $286,491. Noted Oct. 9.

Iowa—State Hy. Comn., Ames, grading 9.176 mi. roads in Lee Co., to A. F. McMahon, Iowa City, $3,657 — gravel surfacing 9.417 mi. Dickinson Co., and 6.902 mi. Osceola Co., to Moe & Nelson, Belmond, $7,618 and $6,348 respectively—2,949 mi. Page Co., to McDougall Constr. Co., Sioux City, $5,762—550 cu.yd. rip rap in Muscatine Co., to W. T. Kelley, Des Moines, $3,108. Grand total $26,493. Noted Oct. 23.

Kansas—State Hy. Comn., Topeka, at Court House, Salina, concrete surfacing 8.543 mi. U. S. Hy. 40S, Federal Aid Project 374-A, 18 ft. Salina Co., to Cook & Stucker, Ottawa, $175,149. Noted Oct. 9.

Massachusetts—Dpt. P. Wks., A. W. Dean, engr., Boston, rein.-con. paving, constructing steel stringer bridge, 9,687 ft. by Attleboro, to P. J. Holland, 24 Ames St., Lawrence, $180,173—rein.-con. paving 883 ft. Clinton, to Guaranty Constr. Co., Shirley, $4,227—bituminous macadam paving 2,325 ft. bridge approaches, Charlemont, to Kelleher Corp., Turners Falls, $34,182—bituminous macadam paving 910 ft. bridge approaches, Buckland, to T. J. Harvey, Adams, $10,070. Grand total $228,652. Noted Oct. 23.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., granite block paving E St., South Boston, Ward 6, to C. Repucci, 10 Garden Court St. Est. $25,000. Noted Oct. 16.

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Streets and Roads (Continued)

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving Navarre St., Ward 18, to C. Capone, 11 Hemlock St., Roslindale. Est. $25,000.

Mass., Melrose—Dpt. P. Wks., City Hall, reconstructing Lower Main St., separate contracts.

New York — Port of New York Authority, 80-90 8th Ave., New York, fill, grading, pumping and reconstructing sewer for roadways of Port Richmond Approach to Kill Van Kull Bridge between Bayonne, N. J. and Port Richmond, N. Y., to J. J. O'Rourke, 238 Gordon St., St. George, $34,254. Noted Oct. 23.

New York—A. W. Brandt, comr. Hys., Albany, repaving 2.28 mi. Suffolk Co., to H. W. Patterson, Ellicott Sq. Bldg., Buffalo, $114,895—0.68 mi. Tompkins Co., to Bolton, Suits, Bolton & Gibbs, Watkins Glen, $28,849—1.23 mi. Nassau Co., to Good Roads Eng. & Constr. Co., 250 Fulton St., Hempstead, $83,646—0.39 mi. Schoharie Co., to M. E. Colle, Inc., LeRoy, $20,989. Grand total $248,379. Noted Oct. 9.

O., Cleveland—Bd. Comrs. Cuyahoga Co., vitr. brick paving 2,450 sq.yd. S. O. M. Center Rd. at Erie R.R. grade crossing elimination, to Loesch & Green Constr. Co., 4169 Pearl Rd., $22,530. Est. $28,400.

O., Columbus—Franklin Co., F. L. Donnally, clk., grading, 4 in. bituminous macadam paving 1.33 mi. Park Rd. 2, Sharon Twp., 18 ft., to J. and L. Stauffer, Westerville. $17,554. Noted Oct. 9.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures 2,689 ft. roads in Northumberland Co., 36 ft., to J. B. Schultz, Buffalo, N. Y., $43,115 — bituminous surface treated macadam surfacing 5,290 ft. York Co., 16 ft., to H. S. Shaul & Sons, Mechanicsburg, $23,907—2,486 ft. York Co., 16 ft., to Graham Constr. Co., Lancaster, $19,828—grading, concrete surfacing 28,035 ft. Westmoreland Co., to J. Cicone & C. G. Centrone, 5732 Westminster St., Phila., $348,795. Grand total $436,645. Noted Sept. 18.

Pa., Pittsburgh—Allegheny Co., 519 Smithfield St., grading, curbing, paving Reimer Way, Climax, Highwood, Viola and Forbes Sts., also Camoania St., to M. O'Herron Co., South 1st and McKean Sts., $34,899 and $20,067 respectively — 11th St., to R. D. Thomas & Co., Jenkins Arcade Bldg., $43,785—Shady Ave., to Garcia Constr. Co., 4200 Kansas St., $10,437—Colway St., to A. F. Jordano Co., 2886 West Liberty Ave., $11,010 — Annan Way, to D. Pavia, 331 Ladson St., $7,355—Pennock Rd., to McDonough & O'Toole, Frick Bldg., $7,413—Delvit Way, to Parkview Constr. Co., Boquet St., $2,417. Grand total $137,383. Also Cadet Ave., to Minsinger Co., 1201 Vickroy St., est. $28,000.

Rhode Island—State Bd. P. Roads, Providence, bituminous macadam paving 1.89 mi. Lincoln, Albion and Manville to Hagan-Thibodeau Constr. Co., Eden Park, $69,479; 1.86 mi. South Kingstown-Richmond, Contr. 3034, to B. C. Jordan, Providence, $32,372. Noted Oct. 16.

West Virginia—State Roads Comn., Charleston, improving roads in Putnam Co., to Huntington, Gravel & Supply Co., Huntington, $23,200 — Den Run and Beatrice Bridge Approaches, Ritchie Co., to Parker Constr. Co., Morgantown, $11,270 and $5,894 respectively—Tyler Co., to Venable & Farkas, Charleston, $6,143—Wood Co., to L. T. Cisler & Son, Marietta, O., $3,817. Grand total $50,326. Noted Oct. 9.

Wisconsin—State and Monroe Co. Hy. Comns., Court House, LaCrosse, improving Option A, Cashton-Ontario Rd., to Barnard-Curtiss Co., 504 Globe Bldg., Minneapolis, Minn., $86,827 — crushed rock surfacing 1.41 mi., to E. Muller, La Farge, $25,747—culverts and Langon Bridge, to A. R. Coffen, Decorah, Ia., $717 and $1,892 respectively—Rumppe Bridge, to A. Brown & Co., Chippewa Falls, $10,265—I-beam and Olson Bridges, to W. Boffke, Ontario, $4,773 and $2,288 respectively — Sheldon and Stoddard Bridges, to R. N. Noffke, Kendall, $3,536 and $2,605 respectively. Grand total $138,650.

Ont., Brampton — Town, bituminous paving Lorne Ave., Alexandria, Union and Wellington Sts., to Stormus Contg. Co. Ltd., Confederation Life Bldg., Toronto, $56,977.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Minn., Rochester—Surveys dredging, constructing rein.-con. dam to make artificial lake, $100,000. S. A. Norling, 343 Gateway Bank Bldg., Minneapolis, engr.

New Jersey—State Bd. Commerce & Navigation, State House, Trenton, stone jetties, timber bulkheads between Sea Bright and Point Pleasant, $1,500,000. Project in abeyance. Private plans. Noted Oct. 2.

BIDS ASKED

Ala., Birmingham—Nov. 24, by A. J. Hawkins, city engr., Sect. 8 Village Creek Drainage Project from west line southeast quarter of Sect. 17, Twp. 17 South, Range 2 West 75th St.; adv. E. N.-R. Nov. 6.

CONTRACTS AWARDED

Ark., Osceola—Bd. Comrs. Sub-District 1, of Dead Timber D. D. 13, Mississippi Co., 57 mi. ditches, incl. 2,289,000 cu.yd. earth excav., 965 lin.ft. timber bridging, to C. Erickson, Penconning, Mich., at $0.0845 per cu.yd.

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Mass., East Boston (sta. Boston)—City, Park Dpt., dredging, filling at East Boston Airport, to Bay State Dredging & Contg. Co., 62 Condor St., $129,500. Noted Oct. 16.

N. B., Tracadie—Dpt. P. Wks., Parliament Bldgs., Ottawa, Ont., breakwater and breastwork in harbor, to Waldo Bosca, Bathurst, $159,069.

Que., Baie St. Paul—Dpt. P. Wks., Parliament Bldgs., Ottawa, Ont., protection work, to Murray Bay Constr. Co., Murray Bay, $9,976.

Public Bond Elections

Coming Bond Elections

Waterworks, Sewers, Street Paving—La Feria, Tex., Nov. 10. $30,000.

Sewerage Disposal Plant—Wichita, Kan., Nov. 4. $500,000.

Bridge Impvts.—Dayton, O., Nov. 4, $100,000.

Bridges—Omaha, Neb., Nov. 4, $2,600,000.

Irrigation Work — El Nido, Calif., Nov. 17, $135,000.

Fire Stations and Equipment—Dayton, O., Nov. 4, $400,000.

Court House—Hays, Kan., Nov. 4, $210,000.

Junior High School Addition — Ebenezer, O., Nov. 4, $175,000.

Grade Crossings and Bridge—Los Angeles, Calif., Nov. 4, $1,330,000.

Bonds Voted

Waterworks—Point Isabel, Tex., $139,250.

Sewers—Point Isabel, Tex., G. Scanlon, mayor, $48,500.

Sewage Disposal Plant — Kingfisher, Okla., Milliken & Whiteneck, Oklahoma City, engrs., $25,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Conn., New Britain—POST OFFICE—Treas. Dpt. at office Superv. Archt., post office, West Main St.

Ill., Rock Island — BARGES — U. S. Eng., ten steel material barges, 4 x 5 x 110 ft.

Mo., Kansas City—DIKES—U. S. Eng., 16,405 ft. dikes and 5,950 ft. revetment at Camden and Sni-bends and Lexington Beach, in Missouri River, near here.

Virginia—DREDGING—U. S. Eng., 182,525 cu.yd. in Rappahannock River.

Tex., Randolph Field—GARAGE—Con. Q. M., 1 story, 100 x 500 ft. garage.

C. Z., Quarry Heights — QUARTERS — Dpt. Quartermaster soon takes new bids 4 field officers quarters, 32 company officers quarters, 27 duplex officers quarters, 1 bachelor officers quarters, two 110 new A.C. barracks, two 200 new A.C. barracks, roads, walks, water distribution, fire protection, sewerage system, electrical work, at Albrook Field. Former bids rejected. Noted July 31.

BIDS ASKED

Calif., Mare Island—CRANE and RUNWAY—Spec. 6310—Nov. 26, by Yards & Docks, Navy Dpt., 40 ton electric gantry crane and runway, at Navy Yard.

D. C., Wash.—SEAWALL—Nov. 13, by U. S. Eng. Office, 1068 Army Bldg., furnishing, placing 15,000 tons 10% more or less rip rap seawall foundation along Anacostia River. Noted Aug. 7.

Fla., Pensacola—AIR COMPRESSORS—Spec. 6187—Nov. 19, by Yards & Docks, Navy Dpt., reciprocating air compressors for Naval Air Station.

Ill., Alton—DREDGING—Nov. 8, by U. S. Eng., 428 Custom House, St. Louis, Mo., 60,000 cu.yd. place measurement in Alton Slough Mississippi River, near here.

Kan., Fort Riley — NURSES QUARTERS — Dec. 2, at office Constr. Q. M., building for nurses quarters; adv. E. N.-R. Nov. 6.

Md., Fort Meade — NURSES QUARTERS — Dec. 3, at office Con. Q. M., constructing, completing nurses quarters; adv. E. N.-R. Nov. 6.

Miss., Gulfport—BUILDING—Nov. 25, by Vet. Bur., additional building, utilities, etc., at U. S. Veterans Hospital. Noted Oct. 2.

Missouri—DIKE—Nov. 20, by U. S. Eng. Office, Postal Telegraph Bldg., Kansas City, 6,180 lin.ft. standard pile clump dikes and 4,800 lin.ft. standard revetment in Missouri River, at Sheeps Nose Bend, 4.7 mi. from Dover. Noted Oct. 30.

Missouri—DIKES—Nov. 26, by U. S. Eng. Office, 428 Customhouse, St. Louis, 4,000 lin.ft. piling dikes in Missouri River at Dozier and Centaur Bends; adv. E. N.-R. Nov. 6.

Mo., Weldon Spring—DIKE—Nov. 26, by U. S. Eng. Office, 428 Custom House, St. Louis, 9,000 lin.ft. piling dikes, in Missouri River; adv. E. N.-R. Nov. 6.

N. Y., New York—DREDGING—Spec. 6312—Nov. 12, by Yards & Docks, Navy Dpt., at U. S. Navy Yard.

N. Y., Oswego—BREAKWATER—Nov. 28, by U. S. Eng., Buffalo, 2,200 ft. rubblemound east arrowhead breakwater, and pierhead at outer end, surmounted by concrete foundation for lighthouse; adv. E. N.-R. Nov. 6. Noted Oct. 9.

Ore., Corvallis—POST OFFICE—Dec. 12, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Pa., Phila. — PIPING — Nov. 28, by Treas. Dpt. at office Sup. Archt., furnishing, installing new brass water piping, at U. S. Post Office.

S. C., Spartanburg—POST OFFICE—Nov. 25, by Treas. Dpt. at office Sup. Archt., U. S. Post Office. Noted Oct. 30.

Va., Quantico — DREDGING — Spec. 6182 — Dec. 3, by Yards & Docks, Navy Dpt., dredging, excavating, fill at Marine Barracks.

W. Va., Clarksburg—POST OFFICE—Dec. 3, by Treas. Dpt. at office Sup. Archt., constructing (except elevators) U. S. Post Office and Court House; adv. E. N.-R. Nov. 6.

W. Va., Morgantown—ELEVATORS—Nov. 13, by Treas. Dpt. at office Sup. Archt., elevators at U. S. Post Office.

Wis., Marshfield—POST OFFICE—Nov. 14, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Wyo., Casper—POST OFFICE—Dec. 1, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office.

T. H., Fort Shafter—QUARTERS—Nov. 14, by Con. Q. M., 49 sets non-commissioned officers quarters, 1 bachelor non-commissioned officers quarters.

CONTRACTS AWARDED

D. C., Wash.—DORMITORY—Dpt. Interior, dormitory group, to Maiatio Constr. Co., 5th and H Sts., $148,250. Noted Sept. 25.

D. C., Wash. — STEEL RADIO TOWERS — Spec. 6163—Yards & Docks, Navy Dpt., 4 steel radio towers, to McCay & Kirtland, 23 West Mount Royal Ave., Baltimore, Md., $12,320.

Ia., Iowa City—EXTENSION—Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office, to H. B. Ryan Co., 500 North Dearborn St., Chicago, Ill., $123,000. Noted Sept. 18.

La., Alexandria — GARAGE — Vet. Bur., garage, to W. Grohne Co., 117 South Bluff St., Joliet, Ill., $18,465. Noted Sept. 4.

La., New Orleans—LUMBER—U. S. Eng. Prytania and Rivers Sts., 100,000 ft. pine lumber, to E. A. Enochs Lumber Co., Natchez, Miss., at $17.90 per 1,000.

Md., Baltimore—DREDGING—U. S. Eng., 300 Custom House, in Baltimore Harbor, to Sanford & Brooks Co., Point Breeze, Baltimore, $109,097; and to Arundel Corp., Pier 2, Pratt St., $36,408. Noted Sept. 11.

Mass., Boston—COMPRESSOR—Treas. Dpt. at office Superv. Archt., compressor for operating elevator doors, to Otis Elevator Co., 810 18th St. N. W., $4,400.

Mass., Pittsfield—EXTENSION—Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office, to C. Weitz Sons, 713 Mulberry St., Des Moines, Ia., $136,193. Noted Sept. 25.

Mich., Battle Creek—HOSPITAL—Treas. Dpt. at office Sup. Archt., 3 story, basement, brick, rein.-con., steel, Camp Custer, to H. B. Ryan Co., 500 North Dearborn St., Chicago, Ill., $239,950. Noted Sept. 25.

Mississippi — EARTHWORK — U. S. Eng., Vicksburg, 86,000 cu.yd. levee work on Mississippi River near Rosedale, to Lowrant Bros., Inc., Vicksburg, at $0.34 per cu.yd. Noted Oct. 20 Daily.

Missouri—EXCAVATING—U. S. Eng., McCall Bldg., Memphis, Tenn., 550,000 cu.yd. in Lower St. Francis Levee Dist., to Williamson & Williams, Batesville, Ark., at $0.2045 per cu.yd.

N. J., Picatinny Arsenal (mail Dover) — POWDER BUILDINGS—Con. Q.M. general contract cannon powder buildings, to Rust Eng. Co., Koppers Bldg., Pittsburgh, Pa. Est. $150,000. Noted Sept. 11.

N. Y., New York — VENTILATING ENTRANCES—Treas. Dpt. at office Sup. Archt., main and emergency ventilating entrances, three 3 story vaults in U. S. Assay Office, to Remington & Sherman Co., 17 Warren St., New York, $21,000. Noted Sept. 25.

Ore., Portland—JETTY REPAIR—U. S. Eng., extending jetty on north side of Tillamook Bay, to Hansen Constr. Co., Failing Bldg., $429,890. Noted Sept. 4.

Tex., Randolph Field—SEWERS—Con. Q. M., sewerage system, to C. A. Anderson, Majestic Bldg., San Antonio, $71,641. Noted Sept. 18.

Va., Fort Monroe — APARTMENTS — Con. Q. M., three 4 family brick tile apartment houses, to Johnson Constr. Co., 601 Law Bldg., Norfolk, $92,427. Noted July 24.

RAILWAYS

CONTRACTS AWARDED

New York—Boston & Main Ry. Co., W. J. Backes, ch. engr., North Station, Boston, Mass., signal tower, Johnsville, to Pitman & Brown Co., 11 Washington St., Salem, Mass. Est. $25,000.

SUBWAYS AND TUNNELS

PROPOSED WORK

Ont., Windsor—Canadian Pacific Ry., J. M. R. Fairbairn, ch. engr., Montreal, Que., Essex Terminal Ry. Co., H. W. Patterson, acting ch. engr., Walkerville, and Cities of Windsor and Walkerville subway, Ellis Ave. $550,000. H. W. Patterson, city engr. of Walkerville, R. J. Desmarais, city engr. of Windsor.

CONTRACTS AWARDED

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., passageway in West 41st St. connecting Queensboro Subway and 8th Ave. Rapid Transit R.R., to Cleverock, Inc., 70 East 45th St., $249,388. Noted Sept. 25.

Subways and Tunnels (Continued)

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 150 Hudson St., railroad duct line, Routes 101 and 102, for Independent System City-Owned Rapid Transit R.R., and sewer in Fulton St., to Pattelli & Wilson, Inc., 1205 61st St., Brooklyn, $289,850. Noted Oct. 2.

GRADE CROSSINGS

PROPOSED WORK

N. J., Atlantic City—Reading R.R. Co., C. Dillenbeck, ch. engr., Reading Terminal, Phila., Pa., preliminary plans eliminating grade crossing by constructing viaduct over tracks from Mississippi and Michigan Aves. $508,675.

New York — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Schuyler Street Crossing, Utica, Oneida Co. and Clover St. Crossing west of Pittsford, Monroe Co.

N. Y., Barton—Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, eliminating grade crossing, Tioga Co.

N. Y., Batavia — Delaware, Lackawanna & Western R.R. Co., G. C. Ray, ch. engr., Hoboken, N. J., undercrossing on existing alignment of highway at railroad grade crossing on Pavilion-Batavia Hy., Genesee Co.

N. Y., Delanson—Delaware & Hudson R.R. Co., J. H. Martin, ch. engr., Albany, eliminating grade crossing on Main St. $75,000, on Cole St. $75,000, and Interchange Crossing $125,000, all Schenectady Co.

N. Y., Pattersonville—West Shore R.R. Co., c/o New York Central, F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing. $125,000.

N. Y., Philadelphia—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., eliminating Main Street Crossing, Jefferson Co. $114,500.

N. Y., Schenectady—Boston & Maine R.R. Co., W. J. Backes, Boston, Mass., eliminating Dutchman's Crossing. $150,000.

O., Steubenville — City, eliminating 3rd St. Grade Crossing, constructing underpass, 24 ft. to be paved for hy. purposes, 12 ft. by Wheeling Traction Co. for tracks, also 4 ft. sidewalk. $300,000. Pennsylvania R.R., T. J. Skillman, Phila., Pa., ch. engr. State, City and Jefferson Co. will share cost.

Okla., Oklahoma City—Preliminary plans 8 span 80 ft. steel, concrete underpasses under new Santa Fe track elevation of main line, 6th to Noble Sts. $347,000. G. F. Brown, City Hall, engr.

CONTRACTS AWARDED

Ill., Chicago—See "Streets and Roads."

N. Y., Utica—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating West Schuyler-Dike Rd. crossing, 3.4 mi. east of here; Stop 2 crossing on West Shore line 5.1 mi. east of South Utica Station, and Utica-Frankfort Hy. crossing 3.8 mi. east of here, to Walsh Constr. Co., Herald Bldg., Syracuse, $141,799. Noted Sept. 11.

DAMS

PROPOSED WORK

Minn., Rochester—See "Excavation, Drainage, Irrigation, Levees, Rivers and Harbors."

AIRPORTS

PROPOSED WORK

Mo., Bridgeton—City of St. Louis, c/o Bd. P. Serv., 208 City Hall, St. Louis, soon takes bids 1 story, 90 x 120 ft. brick, concrete, steel hangar with lean-to on each side 16 x 120 ft. for St. Louis Naval Reserve at St. Louis Flying Field, near here. $35,000. L. R. Bowen, 301 City Hall, St. Louis, engr. A. Osburg, 301 City Hall, St. Louis, archt.

BIDS ASKED

Wash., Seattle—Comrs. King Co. bids about Jan. 1, 100 x 200 ft., concrete, brick, tile, metal sash airplane hangar for Boeing Field. $80,000. T. Hunt, Seattle, co. engr. Federal Govt. will lease half.

CONTRACTS AWARDED

Ariz., Douglas—City, 100 x 120 ft. hangar, galvanized iron on steel frame, to El Paso Fdry. & Machine Co., 1800 East San Antonio St., El Paso, Tex., $12,190.

POWER AND LIGHTING

PROPOSED WORK

Indiana—Indiana Electric Co., Trac. Terminal Bldg., Indianapolis high tension steel tower line from Indianapolis to Newcastle and electric substation. To exceed $25,000. R. E. Brown, 110 North Illinois St., Indianapolis engr.

BIDS ASKED

Calif., Pasadena—Nov. 22, by B. Chamberlain, city clk., steam generating equipment for municipal light plant, incl. (a) two 15,000 sq.ft. boilers, incl. boiler proper, steel supporting members, super-heater water columns, valves, appurtenances, (b) 2 sets tubes, headers, connections, re-circulators, inlet boxes, appurtenances for side, rear and front furnace walls for use in conjunction with boilers in item a, (c) 2 boilers complete with water walls as set forth in item b, (d) additional price (for 2 units) if 3½ in. O.D. tubes on 7½ in. centers are used in front wall over burners. This alternative to be added to items a, b or c.

Ont., Windsor—See "Contracts Awarded."

CONTRACTS AWARDED

Ind., Bloomington—Indiana University, G. W. Cravens, secy., remodeling electric light and power system, to Sanborn Electric Co., 309 North Illinois St., Indianapolis. Est. $25,000.

Ont., Windsor — City Council extending fire signal cable on McDougall St., day labor, under supervision C. J. de Fields, fire chief. $48,000.

SPORTS AND PARKS

PROPOSED WORK

Mass., Fairhaven—I. Dawson, 634 Pleasant St., New Bedford, golf course, club house, Washington St. $50,000 or more. D. J. Ross, Little Compton, R. I., engr.

Mass., Springfield—City, Mayor's Office, City Hall, municipal golf course, Crosstown Blvd. To exceed $25,000. Engineer not selected.

N. H., Concord—Concord Coliseum, Inc., J. S. Crosby, chn. comn., coliseum, Airport Rd. Est. exceeds $25,000. Engineer not selected.

N. J., Irvington (br. Newark)—Town Council, Town Hall, preliminary plans 45 x 90 ft. swimming pool, playground, near Grove St. $25,000 or more. I. J. Casey, Jr., city engr.

N. J., Spring Lake—Bd. Boro Comrs., Boro Hall, revised plans by E. H. Schmeider, 3rd Ave., 1 story pavilion, swimming pool. $150,000. Noted Oct. 23.

N. Y., Piermont—H. H. Corp., c/o Lucht & Anderson, archts., 432 Palisade Ave., Cliffside, N. J., sketches frame bath houses, pavilion, 70 x 180 ft. swimming pool. $150,000.

BIDS ASKED

N. J., North Long Branch (mail Long Branch)—H. I. Braun, archt., 191 Bway., Long Branch, bids about Nov. 15, general contract 1 story bathing pavilion, 350 bath houses, 150 lockers, reception rooms, showers, for S. A. McNair, 388 Ocean Ave., Long Branch. Est. $150,000. Noted Oct. 23.

N. Y., New York—Nov. 11, by Park Bd., W. J. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, general contract, heating, plumbing for comfort station, northwesterly section New York Zoological Park; installing 2 book conveyors in main reading room, New York Public Library, 42nd St. and 5th Ave.—repairing pavilion in Thomas Jefferson Park, near East River, between 112th and 113th Sts.—finishing abandoned contract for comfort station, in Colonial Park, near Bradhurst Ave., opposite 149th St.

CONTRACTS AWARDED

O., Cleveland — City, D. E. Morgan, mgr., superstructure, 2 story, 719 x 790 ft., brick, rein.-con. stadium, Lakefront, to W. J. Schirmer Co., 1720 Euclid Ave. Total est. $2,000,000. Noted Oct. 2.

HEATING AND VENTILATING

PROPOSED WORK

Ind., Angola — J. Brokaw, steam heating plant, sound apparatus, plumbing, electrical apparatus in theatre. $35,000. A. M. Strauss, 415 Cal-Wayne Bldg., Ft. Wayne, engr.

BIDS ASKED

N. J., Secaucus—Nov. 13, by Bd. Freeholders Hudson Co., Court House, Jersey City, heating system for new wing County Hospital, Laurel Hill. $25,000. F. J. Radigan, Court House, Jersey City, co. engr.

N. Y., Long Island City—Nov. 10, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, draining, electrical work and lighting fixtures, P. S. 150, 43rd Ave. from 40th to 41st Sts., for Bd. Educ., 500 Park Ave., New York.

N. Y., Troy—Nov. 7, by Bd. Contr. & Supply, City Hall, new oil burning equipment in P. S. 12, for Bd. Educ. Morgan & Milliman, 30 2nd St., archts.

CONTRACTS AWARDED

Ind., Lawrenceburg—Dearborn Co., new steam heating system in court house, to F. Stuber & Son, Lawrenceburg. Est. $25,000.

Ind., Muncie—City, steam heating plants in 2 fire stations, to J. A. Butts & Son, 108 North Mulberry St., Est. $25,000.

Ind., Oaktown—Oaktown Bank, new steam heating plant, plumbing, new bank fixtures, to F. T. Willis, Oaktown. Est. $25,000.

Ind., Plainfield—Indiana Boys School, 2 new boilers, to Erie City Iron Wks., 4250 College Ave., Indianapolis; new stokers, to Jones Stoker Co., Cincinnati, O.; air pre-heater and repairing engines, to Air Pre-Heater Corp., Cincinnati, O. Est. $25,000.

Mass., Cambridge—Harvard University, and Coolidge, Shepley, Bulfinch & Abbott, archts., Ames Bldg., Boston, heating and ventilating in biological institution, Oxford St. and Divinity Ave., to J. S. Cassedy, 133 Austin St., est. exceeds $25,000; electrical work, to E. C. Lewis, Inc., 121 Federal St., Boston, est. exceeds $25,000; plumbing, to J. A. Cotter Co., 334 Shawmut Ave., Boston, est. exceeds $25,000. Noted Sept. 25 under "Schools."

Mass., Somerville (br. Boston)—City, L. M. Cronwell, mayor, heating and ventilating in high school, Holland St., to F. W. Zemier & Co., 140 Castle St., Boston; plumbing, to P. A. Mooney, 7 Davis Sq., Somerville. Est. exceeds $25,000. Noted Oct. 30 under "Schools."

Mass., Woburn—City, P. J. Gallagher, mayor, heating and plumbing in city hall, police station and court house, to P. T. Foley & Co., 599 Main St., Winchester, est. exceeds $25,000; electrical work to C. L. Devoe 179 Summer St., Boston, est. $25,000. Noted Oct. 9 under "Public."

Mass., Yarmouth — Town, Building Comm., heating and ventilating in high and grade school, to J. H. Shepard Co., Main St., Chatham. Est. $25,000. Noted Oct. 23 under "Schools."

UNCLASSIFIED

BIDS ASKED

Mass., Boston—CABLES, etc.—Nov. 12, by Dpt., P. Wks., J. A. Rourke, comr., cables, lights on Summer St. Bridge.

N. Y., New York—FERRYBOAT—Nov. 19, by A. Goldman, comr. Plant & Structures, Municipal Bldg., steel screw ferryboat.

N. Y., New York—REMOVING ELEVATED COLUMNS—Nov. 11, by Bd. Transportation, J. H. Delaney, chn. 250 Hudson St., removing and relocating roadway columns of elevated railroad structures at River Ave. and McClellan St., and at Boston Rd. and East 177th St., to permit widening McClellan St., and Boston Rd., agreement "JJ."

N. Y., New York—STATION FINISH—Nov. 11, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., station finish work at 155th, 161st, 167th and 170 Street stations.

CONTRACTS AWARDED

Ind., Greencastle—SUBSTATION—Greencastle Telephone Co., H. B. Wells, mgr., sub-station improvements, new wiring, transformers, insulators. $25,000. Owner builds.

Ind., Martinsville—STORE FRONT—R. E. Tronburgh, new store front, incl. plumbing, electrical wiring, to S. A. Hickman, Martinsville. Est. $25,000.

N. J., Hillsdale—TUNNELS—Dpt. Institutions & Agencies, State Office Bldg., Trenton, constructing and continuation concrete tunnel at Hillsdale Hospital, to Ross & Taylor, Inc., 471 Southard St., Trenton, $77,700. Noted Nov. 6.

MATERIALS

BIDS ASKED

LUMBER, POSTS, etc.—**Harlan, Ia.**—Nov. 19, at office Auditor Shelby Co., bridge lumber, piling, posts, corrugated culvert pipe, miscellaneous hardware and paint.

LUMBER and PILING—**Knoxville, Ia.**—Nov. 12, at office Auditor Marion Co., 6 car loads lumber and piling.

STEEL PIPE—**Detroit, Mich.**—Nov. 8, by J. E. Mills, comr. Purchases & Supplies, steel dredge pipe as follows, 240 ft. 30 ft. length pontoon pipe, 496 ft. 16 ft. length shore pipe, one 90 degree pontoon ell.

HOSE, etc.—**New York, N. Y.**—Nov. 14, by P. J. Dooling, comr. Purchase, Municipal Bldg., hose and hose fittings to Dpts. Parks-Bronx, Plant & Structures, Water Supply, Gas & Electricity and Police Dpts.; lumber and wood paving blocks, to Parks-Bronx, Parks-Manhattan, Plant & Structures, Water Supply, Gas & Electricity, and Police Dpts.

TAR—**New York, N. Y.**—Nov. 13, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 25,000 gal. tar for patching, hot application.

BROKEN STONE SCREENINGS, etc.—**St. George, N. Y.**—Nov. 12, by J. A. Lynoch, pres. Richmond Boro, 400 cu.yd. broken stone screenings in Dist. 3; 600 cu.yd. trap rock screenings to asphalt plant; 700 cu.yd. broken stone chips in Dist. 3.

CABLE — **Cleveland, O.** — Nov. 7, by City, underground cable for Div. Light & Power, R. Hoffman, City Hall, engr.

PORTLAND CEMENT—**Phila., Pa.**—Nov. 10, by C. E. Smith, purch. agt. Pennsylvania R.R. Co., Broad Street Sta., Contr. 28-1930, portland cement.

FUEL OIL—**Ottawa, Ont.**—Nov. 12, by Chief Purchasing Agent, Dpt. P. Wks., 498,000 gal. fuel oil for Dominion Public Buildings, in Ottawa and at Central Experimental Farm; 24,000 gal. for Dominion Public Buildings in Hull.

CONTRACTS AWARDED

ASPHALT OIL—**New Jersey**—State Hy. Dpt., State Office Bldg., Trenton, 42,800 gal. asphalt oil, to Warner Quinlan Co., 2 Park Ave., New York, at $4,790; 1,395 gal. concrete sand and 2,325 tons concrete stone or gravel, to S. R. Upton, 9 Clinton St., Newark, at $1.60 per ton.

FUEL OIL — **Boston, Mass.** — City, Supply Dpt., heavy fuel oil to Boston City Hospital and Sanatorium Division from Nov. 1 to Dec. 30, 1930 with option of extending contract until Sept. 30, 1931, to Colonial-Beacon Oil Co., 20 Providence St., 42 gal. bbl. at $0.0325 per gal.-$1.04 per bbl. (according to when and where delivered).

EQUIPMENT

PROPOSED WORK

TRUCK—**Riverside, Calif.**—W. L. Carlson, city purch. agt., purchasing 2.5-3 ton motor truck.

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Equipment (Continued)

MOTOR CONTROL— Ossining, N. Y.—Dpt. Correction, State Office Bldg., Albany, bids in December motor control of south gate Sing Sing Prison.

BIDS ASKED

TRUCK and HOIST—Fullerton, Calif.—Nov. 18, by F. C. Hezmalhalch, city clk., 1.5 ton motor truck and hydraulic hoist.

CRANES—Detroit, Mich.—Nov. 25, by Bd. Water Comn., 3 electric overhead traveling cranes for power plant, Springwells Station, Contr. PC-76. G. H. Fenkell, genl. mgr. and ch. engr.; adv. E. N.-R. Nov. 6.

LAUNDRY EQUIPMENT—Jersey City, N. J.—Nov. 13, by Bd. Freeholders Hudson Co., Court House, laundry and hospital equipment and plumbing connections for Contagious Diseases Hospital. $5,000. F. J. Radigan, Court House, co. engr.

PUMP—St. George, N. Y.—Nov. 12, by J. A. Lynch, pres. Richmond Boro, Boro Hall, replacing pump at Cromwell Ave. Sewage Pumping Plant; constructing relief drain in Baker Pl.

BOILER SETTINGS, etc. — Cleveland, O. — Nov. 7, by City, boiler settings, fan and coal larries for boiler house at Warrensville Farm.

TRACTOR, etc.—Pierre, S. D.—Nov. 14, by Director of Purchasing & Printing, 3 V-type tractor, steel snow plows with hydraulic hoists and wings, for caterpillar 60 tractor; one V-type tractor steel snow plow with hydraulic hoists and wings; two-V-type truck steel snow plows; one V-type truck steel snow plow for Oshkosh 4 wheel drive truck; one V-type truck steel snow plow for Freeman four wheeled drive truck; one V-type truck steel snow plow for Chevrolet 14 ton truck; three motor graders steel snow plows, one motor grader steel snow plow; two motor grader steel snow plows without wings and one set steel wings.

TRACTOR, etc.—Brownsville, Tex.—Nov. 10, by Cameron Co., c/o O. C. Dancy, Brownsville, 1 crawler type tractor, 60 drawbar hp. or more, one 12 ft. leaning wheel grader, 1 crawler type motor grader with 128 in. blade.

CONTRACTS AWARDED

PUMP—Atlantic, Ia.—City, T. E. Nichols, city clk., 150 g.p.m. turbine pump, to Fairbanks, Morse & Co., 316 Court St., Des Moines, $735.

FOREIGN

France — Trefileries & Laminoirs, Havre, plans 30,000 ton per year electrolytic copper refinery, under technical aid contract.

Buildings

RESIDENTIAL

BIDS ASKED

Calif., Los Angeles—See "Contracts Awarded."

N. J., Asbury Park—Tillion & Tillion, archts., 48 West 48th St., New York, taking bids general contract 6 story, basement, brick, steel, Grand and 4th Aves., for C. E. Van Winkle, 501 Grand Ave. $500,000.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

Wash., Yakima—Nachez Hotel Co. bids about Jan. 1, general contract 13 story, basement hotel, $300,000. H. Bittman, Securities Bldg., Seattle, archt.

CONTRACTS AWARDED

Calif., Los Angeles — H. Feigenbaum, 419 Union Bank Bldg., 13 story, basement, 135 x 150 ft., rein.-con., hollow tile, stone, 410 North Rossmoyne Ave., $400,000. Owner builds. M. Maltzman, 704 Union Bank Bldg., archt.

Conn., Greenwich—Owner, 6 story, 65 x 90 ft. apartment, Elwood Pl., to J. Zilucca, 34 Putnam Ave. Est. $160,000. Contractor taking bids materials, construction and subcontracts.

N. Y., Brooklyn—E. Carlson, 153 Pierrepont St., 6 story, basement, 100 x 120 ft., Ocean and Voorhies Aves., separate contracts. $190,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn — D. and B. Engineering Corp., S. Sperlin, pres., 8665 24th Ave., 6 story, West 8th St. and Avenue P, day labor and separate contracts. $225,000. M. Hirsch, 350 Stone Ave., archts.

N. Y., Brooklyn—Five Hundred Fifty Ocean Avenue Corp., J. Perlbinder, pres., 332 West 149th St., New York, Ocean and Lincoln Aves., separate contracts. $400,000. Franklin Bates & Heindsmann, 2526 Webster Ave., New York, archts.

N. Y., Brooklyn — Four Hundred Ten East 17th Street Corp., G. Kramer, pres., 1730 Carroll St., 6 story, 74 x 80 ft., East 17th St. and Dorchester Rd., separate contracts. $150,000.

N. Y., Brooklyn — P. J. Hoey Co., 166 Montague St., 6 story, 70 x 75 ft., Beverly Rd. and East 19th St. separate contracts. $150,000. W. T. McCarthy, 147 Pierrepont St., archt.

N. Y., Brooklyn—N. Sokolow, 667 Crown St., Montgomery St. and Utica Ave., separate contracts. $150,000. S. L. Malkind, 93 Court St., archt.

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N. Y., New York — E. S. Brandt Building Corp., 12 East 41st St., apartment, 512 West 112th St., separate contracts. $150,000. G. G. Miller, 545 5th Ave., archt.

N. Y., New York — Thirty-Fourth-Thirty-Fifth Street Corp., L. J. Mead, pres., 10 West 33rd St., apartments, stores, 216 East 35th St., to Shroder & Koppel, 420 Lexington Ave. Est. $500,000.

CLUBS

PROPOSED WORK

Ia., Dubuque—Masonic Temple Assn., G. L. Dewey, secy., P. O. Box 165, soon lets contract 3 story, mezzanine, balcony, 100 x 147 ft., rein.-con., brick, stone, steel, 12th and Locust Sts. $250,000. R. F. Moore, 415 O. R. C. Bldg., Cedar Rapids, archt. Noted July 24.

Mass., Boston—Durant, Inc., 336 Huntington Ave., revised plans by Coolidge & Carlson, 89 State St., 14 story, basement, 75 x 325 ft., brick, steel clubhouse hotel, plain found., Huntington Ave. Est. exceeds $150,000. Noted May 2, 1929 under "Buildings—Commercial."

N. J., Collingswood—Ancient Accepted Scottish Rite, Freemasons, F. E. Hinelime, com., 39 South 6th St., Camden soon lets contract 4 story, basement, tower, 309 x 390 ft., brick, steel, rein.-con. consistory cathedral, McGill Ave. and White Horse Pike. W. W. Sharpley, 225 East Washington St., Phila., Pa., archts.

N. J., Somerville — B. P. O. E., West End Ave., 2 story, basement, brick, steel club, $150,000. Project in abeyance. Noted Oct. 9.

BIDS ASKED

Okla., Oklahoma City—Nov. 15, by Hawk & Parr, archts., Cotton Exch. Bldg., 10 story, basement, 75 x 140 ft., rein.-con., brick, plain found., 1st St., for Y. W. C. A. $700,000. Noted Jan. 2.

HOSPITALS

PROPOSED WORK

N. J., Weehawken—North Hudson Hospital, Park Ave., plans by S. Jones & Associates, Inc., 25 West 45th St., New York, 5 story, basement, brick, steel nurses home and training school, $350,000. Noted Nov. 14, 1929, Daily.

N. Y., New York—Lutheran Hospital of Manhattan, Convent Ave. and 144th St., plans by E. Djorup, 1345 Chisholm St., hospital, 429 West 144th St. $150,000.

BIDS ASKED

Mich., Ann Arbor—Nov. 11, by G. R. Thompson, budget dir., 2 story, brick, rein.-con., steel hospital addition, for University of Michigan, University Hall. $150,000. A. Kahn, 1000 Marquette Bldg., Detroit, archt. Noted Oct. 30.

Mo., St. Louis — St. Louis University, R. Johnston, pres., 221 South Grand Blvd., bids about Dec. 15, general contract Firmin Desloge Hospital, 14½ story, 48 x 228 ft., rein.-con., brick, stone, 4 story, basement, 46 x 93 ft. sisters home, power plant, laundry, employees building, Grand Blvd. between Vista and Rutger Sts. $1,000,000. Study & Farrar, 1363 Arcade Bldg., and A. J. Widmer, 1217 Fullerton Bldg., assoc. archts. Noted July 10.

N. Y., New York—See "Contracts Awarded."

Pa., Phila.—Nov. 14, by City, Dpt. Public Health, A. A. Cairns, dir., City Hall Annex, 5 and 6 story, basement, 55 x 104 ft., two 36 x 116 ft. and two 31 x 63 ft. wings, rein.-con., brick, steel tuberculosis hospital, plain found., 34th and Pine Sts. P. H. Johnson, Widener Bldg., archt. Noted Sept. 11.

CONTRACTS AWARDED

Minn., Hopkins — Glen Lake Sanatorium Comn., E. C. Gale, chn., 1430 Rand Bldg., Minneapolis, general contract hospital, service building, to J. C. Nelson & Son, 1641 Hennepin Ave., Minneapolis. Former contract rescinded. Noted Oct. 23.

N. Y., New York — St. Luke's Hospital, Amsterdam Ave. and 113th St., hospital, to C. P. Boland, 101 Park Ave. Bids Nov. 12, for steel, mechanical trades.

O., Dayton—Good Samaritan Hospital, brick, steel, concrete, plain found., to C. H. Shook, Inc., 3rd Natl. Bldg., $805,000; plumbing and heating, to H. J. Osterfeld Co., 413 South Main St., $263,000; electric wiring, to Seitz-Breidenbach Co., 2024 Salem Ave., $50,000. Grand total $1,118,000. Noted Oct. 9.

CHURCHES

PROPOSED WORK

N. J., Jersey City—Westminster Presbyterian Church, H. L. Wyatt, pastor, 304 Academy St., sketches by W. Neumann, 26 Journal Sq., 2 story, brick, steel, Academy St. $200,000.

N. J., West New York — First Church of Christ Scientist, J. E. Orth, pres. Bd. Trustees, 208 49th St., Union City, sketches 2 story, basement, brick, steel, 10th St. and Boulevard E. $150,000.

N. J., Woodcliffe—Lutheran Church of Our Savior, H. Koeffler, chn. building comn., Hamilton Ave. and 1st Pl., 2 story, basement, brick, steel, plain found., Hudson Blvd. and Hegeman Pl. Project in abeyance. Noted Oct. 23.

BIDS ASKED

Mass., Leominster — St. Cecilia's Roman Catholic Parish, J. Chicoine, pastor, 168 Mechanic St., taking bids brick, stone church, $150,000. D. R. Baribault, 1562 Main St., Springfield, archt.

CONTRACTS AWARDED

Mo., St. Louis—Seventh Church of Chirst Scientist, Kansas St. and Tennessee Ave., 4 story church, incl. auditorium, 800 seating capacity, Sunday school, 500 capacity, reading rooms, library, rein.-con., brick, terra cotta, Kansas St. and Tennessee Ave., to Humes-Deal Co., Arcade Bldg. Est. $200,000.

SCHOOLS

PROPOSED WORK

Me., Lewiston—Bates College, H. W. Rose, Lewiston, plans by Miller & Beal, Inc., 465 Congress St., Portland, 4 and 5 story, basement, 55 x 150 ft., brick dormitory, plain found. To exceed $160,000. Project held up until spring. Noted Oct. 16.

Mass., Charlestown (sta. Boston) — City of Boston, Dpt. School Buildings, 2 story, basement, brick, limestone intermediate school, plain found. $640,000.

Mass., Dover—Town, Bd. Selectmen, sketches by Shepard & Stearns, 65 Franklin St., Boston, altering and constructing 2-story, brick, stone addition to Junior and Senior High School, plain found., Springdale Ave. $150,000.

Mass., Leominster—St. Leo's Roman Catholic Church, M. G. Slattery, 108 Main St., sketches by J. W. Donohue, 1200 Main St., Springfield, convent, 128 Main St. $150,000-$200,000.

Mass., Roslindale (sta. Boston) — City of Boston, Dpt. School Buildings, soon takes bids 2 story, basement, brick, limestone, plain found., Chas. Sumner Dist. $235,000.

N. H., Derry—St. Thomas Aquinas Roman Catholic Church, M. Redden, pastor, 26 Crystal St., soon lets contract 2 story, basement, brick, steel school, convent, plain found. $150,000 or more. J. J. O'Shaughnessy, 80 Boylston St., Boston, Mass., archt., and R. D. Kimball Co., 6 Beacon St., Boston, Mass., engrs. Noted Oct. 30.

N. J., Harrington Park—Bd. Educ., Boro Hall, plans by W. H. Wright, Harrington Park, 2 story, basement, brick, steel school addition, plain found. $150,000. **Maturity probably soon.**

N. J., Jersey City—Sacred Heart School, J. Ripple, pastor, Bayview and Jackson Aves., 2 story, basement, brick, steel school addition, $150,000. Project in abeyance. Noted Oct. 9.

N. J., North Plainfield (mail Plainfield)—Bd. Educ., 125 Sommerset St., will not build school. Project abandoned. Noted Oct. 23.

N. J., Perth Amboy—Bd. Educ., 261 State St., Junior and Senior High School, 3 story, basement, brick, steel, Chamberlain, Colgate and Cleveland Aves. $150,000. Project in abeyance. Noted July 10.

N. J., Prospect Plains — Monroe Twp. Bd. Educ., School House, 2 story, basement school, Jamesburg-Englishtown Rd. Project in abeyance. Noted May 29.

N. Y., New York—Bd. Educ., 500 Park Ave., plans by W. C. Martin, archt. and supt. School Buildings, P. S. 103, Bronxwood Blvd. and 229th St. $800,000.

N. Y., Syracuse—City School, Forest Hill Dr. $200,000. W. Cronin, State Tower Bldg., engr.

O., Bexley—Bd. Educ., J. Hanney, clk., 311 South Columbia Ave., plans by Miller & Reeves, 203 East Broad St., Columbus, 3 story, basement, brick, steel, concrete, Cassingham St. Election Nov. 4, $375,000 for same.

Tex., Wichita Falls—Bd. Educ., Junior College, rein.-con., brick, incl. class rooms, auditorium, cafeteria, plain found. $300,000 bond election soon for same.

BIDS ASKED

Del., Newark—Nov. 17 (extended date), by Delaware School Foundation, A. J. Taylor, vice pres., Du Pont Bldg., Wilmington, general contract 2 story, basement, 65 x 155 ft., brick, rein.-con., steel addition, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Oct. 23.

Ill., Chicago—Nov. 12, by Bd. Educ., 188 West Randolph St., E. Withall, bus. mgr., Clissold Elementary School, Gresham Elementary School addition, Lane Technical High School, Steinmetz Senior High School, Smyzer Elementary School, Senn Senior High School addition terrazzo, tile, also pipe covering for sundry schools. P. Gerhardt, 188 West Randolph St., archt.

Ind., Indianapolis—Nov. 11, by Bd. School Comrs., A. B. Good, bus. dir., 150 North Meridian St., School 69, Keystone Ave. between 34th and 35th St. Harrison & Turnock, 1001 Architects and Builders Bldg., archts. and engrs. J. M. Rotz Eng. Co., 704 Merchants Bank Bldg., engrs.

N. J., Morristown—E. G. Perrot, archt., 1211 Arch St., Phila., Pa., taking bids general contract 2 story, basement, brick, steel gymnasium addition, for Our Lady of Good Council Church. $150,000.

N. J., New Brunswick—Nov. 12, by York & Sawyer, archts., 100 East 42nd St., New York, general contract 3 story, basement, 165 x 190 ft., brick, steel, rein.-con. gymnasium, College Field, for Rutgers University, J. T. Doyle, College Ave. $600,000. Noted Oct. 16.

N. J., New Brunswick—Bd. Educ., Livingston Ave., bids about Dec. 16, 2 story, basement, brick, steel, rein.-con. addition to Senior High School, Livingston Ave. $150,000. A. Merchant, 1 Elm Row, archt. Noted Sept. 18.

Schools (Continued)

N. Y., Geneva—Nov. 26, by Commissioner Dpt. Educ., State Education Bldg., Albany, horticultural building at State Agricultural Experiment Station; adv. E. N.-R. Nov. 6.

N. Y., Hollis—Nov. 11, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 35, 90th Ave. from 191st to 192nd Sts., for Bd. Educ., 500 Park Ave., New York. Noted Oct. 30.

N. Y., Syracuse—Nov. 10, by Bd. Contr. & Supply, City Hall, grade school, Forest Hill Dr. $386,000. W. Cronin, State Tower Bldg., archt. Noted June 27.

O., Oxford—Nov. 18, by Miami University, W. T. Rondebush, secy., 2 story, basement, 136 x 350 ft. and 69 x 136 ft., brick, steel, concrete physical building. $350,000. Garber & Woodward, 616 Walnut St., Cincinnati, archts.

CONTRACTS AWARDED

Conn., Bridgeport—Junior College of Connecticut, E. E. Carbright, pres., altering and constructing 2 story, basement, brick college addition, plain found., to Hewlett Co., 886 Main St. Est. $150,000. Noted Sept. 25.

Ill., Chicago—Armstrong, Furst & Tilton, archts., 11 South La Salle St., general contract 4 story, rein.-con., Indiana limestone, brick, to R. F. Wilson Co., 1851 Elston Ave. Est. $650,000. Noted Aug. 28.

Ia., Waterloo — W. C. Logan, secy., 405 Pioneer Natl. Bldg., general contract Lowell Grade School, 2 story, 103 x 238 ft., rein.-con., brick, to J. G. Miller Constr. Co., Waterloo, $143,625; heating and plumbing, to Carsten Bros., Ackley, $29,125. Noted Sept. 11.

Md., Baltimore—Bd. Awards, 3 story, 52 x 152 ft. brick administration building, to P. C. Streett Eng. Co., 404 St. Paul St., $218,000. Noted Oct. 16.

Minn., Albert Lea—Bd. Educ., general contract 72 x 118 ft. gymnasium, to Tappager Constr. Co., Albert Lea; plumbing, heating, ventilating, to W. D. Cudahy, Mankato; electrical work, to Gardner Electric Co., Albert Lea; heat regulator, to National Regulator Co., 2301 North Knox Ave., Chicago, Ill. Est. $140,000. Noted Sept. 18.

Neb., Sidney — Bd. Educ., Dist. 1, H. M. Ladegard, secy., general contract 2 and 3 story, basement, 200 x 200 ft., rein.-con., brick high school, Elm St., to J. L. Soderberg Constr. Co., 215 Kennedy Bldg., Omaha, $114,610. This corrects report in Oct. 2 issue.

N. J., New Brunswick — New Jersey State College for Women, Nichol Ave., hardwood flooring for 2 and 3 story, basement recreation building, dormitory, to Highland Park Lumber Co., Cleveland Ave., Highland; metal lath, to R. C. Hunt, 39 Coolidge Rd., Maplewood; steel casements, to Truscon Steel Co., 605 Broad St., Newark; hollow metal work, to Hart & Hutchinson Co., 101 Park Ave., New York; tile work, to Borring Tile & Mantel Co., 335 Maple St., Perth Amboy. Noted July 17 under "Contracts Awarded."

N. J., Union City — Holy Family Roman Catholic Church, J. N. Grief, pastor, steel for 3 story, basement high school addition, to F. T. Schaefer, 268 River Rd., Edgewater; masonry materials, to J. Schmitt & Sons, Inc., 1631 Paterson Plank Rd., Secaucus; steel sash, to Metal Windows, Inc., 592 Ogden St., Newark. Noted Sept. 25.

N. Y., Geneseo — Commissioner Dpt. Educ., State Office Bldg., Albany, general contract practice school at New York State Normal School, to C. A. Foote & Son, Mount Morris, $253,625; heating, to P. W. Schneider, Inc., 307 Lafayette St., Utica, $27,998; sanitary work, to C. C. Grimm, Buffalo, $15,555; electrical work, to Blanding Electric Supply Co., 198 Washington St., Binghamton, $15,697. Grand total $312,875.

Pa., Bellevue — Bd. Educ., J. W. Graham, secy., 25 South Balph Ave., general contract Grant Grade School, 2 story, basement, 62 x 115 ft., brick, limestone, rein.-con., to H. Miller & Sons Co., 2565 5th Ave., Pittsburgh, $109,885. Noted Oct. 23.

R. I., Cranston (mail Providence)—City, H. Fenner, supt. high school, 2 story, basement, brick, stone grade school and assembly hall, plain found., to E. Turgeon, 36 Exchange Pl., Providence, $148,953. Noted Oct. 23.

Ont., Toronto — Emmanuel College, Queens Park, general contract 3 story, basement, rein.-con., steel, stone students building, at Emmanuel College, to Jackson-Lewis Constr. Co., Federal Bldg., $250,000. Noted Sept. 25.

THEATRES

PROPOSED WORK

Calif., Healdsburg—Redwood Theatres, Inc., postponed construction rein.-con. theatre. $150,000. N. R. Coulter, 46 Kearney St., San Francisco, archt. Noted May 15.

Calif., Holtville—Holtville Income Properties, Inc., plans by Perrine & Renfro, Lincoln Bldg., Los Angeles, 5 story, 110 x 150 ft., rein.-con., steel theatre, hotel, office, store building. $150,000.

Calif., Woodland — National Theatres Syndicate, Inc., 25 Taylor St., San Francisco, theatre $200,000. Project postponed indefinitely. Bliss & Fairweather, Balboa Bldg., San Francisco, archts. Noted May 22.

CONTRACTS AWARDED

Calif., Los Angeles—Westwood Realty Co., rein.-con. theatre, Broxton Ave., to Beller Constr. Co., 6513 Hollywood Blvd., $150,000.

Tex., Pampa — Griffith Bros., 3 story in height, brick, rein.-con., steel theatre, 1,150 seating capacity, plain found., to J. T. Glover, Pampa, $125,000.

BANKS

PROPOSED WORK

N. J., Montclair—Holmes & Schmid, archts., 42 Church St., soon lets contract general contract 1 story, basement, mezzanine bank, Grove St., for Town Trust Co., 79 Walnut St. Est. $150,000. Noted Oct. 23.

N. J., South Orange—Myers & Shanley, archts., 24 Walnut St., Newark soon lets contract general contract altering and constructing 2 story, basement, brick, steel bank addition, South Orange Ave., for South Orange Trust Co., 53 South Orange Ave. $150,000. Noted Oct. 30.

CONTRACTS AWARDED

Mass., Boston—Owner, E. S. Welch, trustee, 73 Tremont St., 4 story, basement, irregular sized, brick store, office, plain found., 12 Washington St., to Gibson & Williams, 65 Long Wharf. Est. $150,000.

N. Y., Yonkers—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, general contract 12 story bank, office, to F. Angelilli, 56 West 45th St., New York, and 26 Main St. Est. $1,000,000. Noted June 12.

Okla., Oklahoma City—First Natl. Bank, 140 West Main St., 32 story, 140 x 150 ft., rein.-con., brick, steel, incl. offices, caisson and concrete pile found., 1st St., to Manhattan Constr. Co., Manhattan Bldg., Muskogee. $3,000,000. Noted July 24.

Pa., Pittsburgh—Federal Reserve Bank, Superior Ave., Cleveland, O., 8 story, basement, 75 x 197 ft., granite, stone, marble, bronze, aluminum, Grant St., to Mellon-Stuart Co., Oliver Bldg. Est. $1,000,000.

OFFICES

PROPOSED WORK

Calif., Los Angeles—State Mutual Building & Loan Assn., 722 South Spring St., plans by W. Richards, Architects Bldg., 3 story, basement, 50 x 125 ft. Class A office building, 5th St. near Hill St.

D. C., Wash.—Owner, c/o Epple & Kahrs, engrs. and archts., 44 Commerce St., Newark, office. $3,000,000. **Maturity probably soon.**

Mass., Boston—Owner, c/o E. B. Stratton, archt., 113 State St., altering 4 story, basement, brick, stone, steel residence into office building, 318-320 Commonwealth Ave. $165,000.

N. Y., New York—Henry L. Doherty & Co., 60 Wall St., office, Battery Park. To exceed $5,000,000. Project in abeyance. Noted May 15.

N. Y., New York—Fred F. French Co., 551 5th Ave., 83 story, incl. stores, 6th Ave. from 43rd to 44th Sts. $30,000,000. Project in abeyance. **Maturity indefinite.** Noted Apr. 24.

Utah, Salt Lake City—Ashton-Jenkins Co., 32 South Main St., 10 story office building for physicians and surgeons. $500,000. Architect not selected.

BIDS ASKED

N. J., Newark—W. E. Lehman, archt., 972 Broad St., bids about Dec. 15, general contract 2 story, basement, 40 x 250 ft., brick, steel office, showrooms, warehouse, Frelinghuysen Ave., for Majestic Radio Co., 259 Madison Ave. Est. $150,000. Noted Oct. 16.

N. Y., New York — S. Friedberg, 15 West 47th St., report in Sept. 18 issue, stated taking bids on separate contracts 28 story, office and stores, 90 John St. and 24 Gold St. Contracts let for excavation, foundations and structural work. Bids will soon be taken for mechanical items. For name of mechanical engineer in charge address Business News Dpt., Engineering News-Record, Tenth Ave. at 36th St., New York.

N. Y., New York—Bethlehem Eng. Corp., 1560 Bway., bids about Dec. 1, excavating and foundations, 8th Ave. from 41st to 42nd Sts. Total $5,000,000. Noted Mar. 13 under "Contracts Awarded."

N. Y., New York—Gresham Constr. Co., contractors, 18 East 48th St., taking bids excavation, foundations for office, 432 Madison Ave., for Almy Realty Co., 141 Bway. Total est. $3,000,000. Noted May 1 under "Contracts Awarded."

CONTRACTS AWARDED

Mass., Everett—Merrimac Chemical Co., Inc., 2 story, basement, 75 x 160 ft., rein.-con. office, to W. M. Bailey Co., 88 Broad St., Boston. Est. $150,000. Noted Oct. 9.

N. J., Newark—Starrett Investing Corp., 101 Park Ave., New York, general contract 20 story office, loft, 550 Ogden St., to Starrett Bros. & Eken, 101 Park Ave. Est. $8,500,000. Project is in preliminary stage only.

N. Y., Albany—P. J. Pagona & Son, owner, archt. and builder, 61 Maiden Lane, will build 3 story, steel, brick, plain found., Arch Court. $175,000.

N. Y., New York—Bway.-John Street Corp., E. A. Cohen, pres., 206 Bway., general contract 23 story, brick, rein.-con. office, to Shroder & Koppel, 420 Lexington Ave. Contractors soon let contract for electrical work, other contracts have been awarded. Noted Feb. 13.

N. Y., New York—Carpenter-Madison Corp., J. H. Carpenter, pres., 551 5th Ave., office, to Dwight P. Robinson Co., 125 East 46th St. Est. $2,000,000. Contractor awarding separate contracts. Noted June 26.

N. Y., New York—Eighty East 56th Street Corp., S. Minskoff, pres., 521 5th Ave., 17-story, 33x100 ft., brick, steel office, store and manufacturing, to S. Minskoff, 521 5th Ave. Contractor takes preliminary bids late in November. Noted Sept. 18.

STORES

PROPOSED WORK

Pa., Phila.—George Allen, Inc., T. J. Sinclair, Sr., pres., plans by C. E. Wunder, 1520 Locust St., 10 story, basement, 25 x 230 ft., rein.-con., brick, steel, limestone, plain found., 1214 Chestnut St. $500,000.

BIDS ASKED

Calif., Los Angeles—Walker & Eisen, archts., Western Pacific Bldg., taking bids 2 story, basement, 175 x 175 ft., rein.-con., brick, Wilshire and Westmoreland Sts., for Westmoreland Building Co., c/o architects. $200,000 or more.

N. J., East Orange—Starrett & Van Vleck, archts., 393 7th Ave., New York, taking new bids general contract 4 story, basement, 100 x 110 ft., brick, steel, rein.-con. department store, Main and Prospect Sts., for R. H. Muir, 546 Main St. $150,000. Noted Oct. 16.

N. J., Jersey City—M. A. Wolf, archt., 845 Broad St., Newark, bids about Dec. 1, general contract 3 story, basement, brick, steel, stores, apartment, Manhattan and Terrace Aves., for A. Cordano, c/o architect. Noted Oct. 9.

PUBLIC

PROPOSED WORK

Mass., Boston—OFFICE—Commonwealth of Massachusetts, Dpt. P. Wks., brick, steel, office, site under consideration. $1,000,000. Architect not selected.

Mass., Springfield—ART—City Library Assn., N. D. Hill, pres., art building, State and Chestnut Sts. $350,000. Architect not selected.

N. J., Leonia—MUNICIPAL—Bd. Boro Council, Boro Hall, sketches by Lucht & Anderson, 432 Palisade Ave., Cliffside, 2 story, basement, brick, steel. $150,000.

N. J., New Brunswick—WORK HOUSE—Bd. Freeholders Middlesex Co., Dpt. P. Welfare, C. R. Wicoff, chn., Court House, brick work house addition, Georges Rd. $150,000. **Maturity probably soon.** Architect not selected.

N. Y., Beacon—DORMITORY—Dpt. Correction, State Office Bldg., Albany, bids in December, female ward group, auditorium and chapel, communicating corridor, in Matteawan State Hospital. Noted Oct. 2.

N. Y., Brooklyn — MUSEUM — Brooklyn Museum, Eastern Parkway, plans by McKim, Meade & White, 101 Park Ave., New York, museum addition, Eastern Parkway and Washington Ave. $265,000.

N. Y., Elmira—REFORMATORY—Dpt. Correction, State Office Bldg., Albany, bids latter part November, school, hospital, at Elmira State Reformatory. Noted Sept. 18.

N. Y., Great Meadows—ADMINISTRATION—Dpt. Correction, State Office Bldg., Albany, bids in December, administration building at Great Meadows Prison. Noted Oct. 2.

N. Y., Red Bank—LIBRARY—Bd. Boro Council, Boro Hall, 2 story, basement, brick, steel library. $150,000. Architect not selected. **Maturity indefinite.**

N. C., Raleigh—AUDITORIUM—City, E. B. Culbreth, mayor rebuilding auditorium, recently destroyed by fire, Fayetteville St. $250,000 Architect not selected.

O., Dayton — FIRE STATIONS and EQUIPMENT—Election Nov. 4, $400,000, constructing, equipping buildings, purchasing fire engines and apparatus, placing underground wires and signal apparatus. D. C. Brower, chn.

BIDS ASKED

Ind., Evansville—LIBRARY—Dec. 1, by Public Library Bd., 3 story, basement, rein.-con., stone, 5th and Locust Sts. $300,000. Walker & Weeks, 2341 Carnegie St., Cleveland, O., archts. Noted May 29.

CONTRACTS AWARDED

Calif., Los Angeles—JAIL—Bd. P. Wks., City Hall, general contract 5 story, basement, 45 x 200 ft., L shaped, rein.-con., for City, to Schuck Constr. Co., 1937 West 62nd St. $129,458; plumbing, to F. C. Schilling, 3215 Beverly Blvd., $31,637. Noted Oct. 1.

Calif., Ventura—COURT HOUSE and JAIL—Bd. Comrs. Ventura Co., general contract 3 story, 62 x 118 ft., steel, brick, rein.-con., to Union Eng. Co., 5905 Pacific Blvd., Huntington Park, $198,978. Noted Sept. 4.

Tex., Liberty—COURT HOUSE—Liberty Co., c/o C. R. Wilson, judge, 3-story, 75x150 ft., brick, stone, steel, rein.-con., to M. H. Ryland, Uvalde, $177,500. Noted Oct. 2.

BUILDINGS—UNCLASSIFIED

BIDS ASKED

Mo., St. Louis—MERCHANDISING MART—Nov. 24, by Terminal Railroad Assn. (owner), 1800 Market St. and St. Louis Mart, Inc. (lessee) c/o H. C. Martin, 315 North 10th St., general contract 8 story, basement, 20 story tower, 330 x 358 ft., rein.-con., brick, stone, 1,000,000 sq.ft. floor space, 12th and Poplar Sts. $5,000,000. Private plans. W. J. Knight & Co., Wainwright Bldg., engrs. Noted Sept. 18.

Ill., East St. Louis — STATION — Terminal Railroad Assn. of St. Louis, H. Miller, pres., 1800 Market St., St. Louis, Mo., H. J. Pfeiffer, ch. engr. bids about Jan. 1, 3 story, basement, rein.-con., brick, stone, Main St. $700,000. Noted July 31.

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Buildings Unclassified (Continued)

N. J., Newark—MARKET—F. H. Koenigsberger, archt., 48 Walnut St., bids about Nov. 15, general contract 2 story, basement, brick, steel, Washington and Linden Sts., for Steuben Holding Corp., 60 Park Pl. Est. $150,000. Noted Oct. 23.

N. Y., New York — HOME — Nov. 11, by Seamen's Christian Assn. and Y.M.C.A., 420 Lexington Ave., general contract seamen's home, 11th Ave. and 20th St. $1,000,000. Shreve, Lamb & Harmon, 7 East 44th St., archts. Noted Sept. 25.

CONTRACTS AWARDED

Georgia—EXCHANGES—Southern Bell Telephone & Telegraph Co., Hurt Bldg., Atlanta, 1 story, basement, 53 x 79 ft., and 1 story, 21 x 51 ft. garage, at Buckhead, Atlanta, and 1 story, basement, 52 x 79 ft. exchange at College Park, to Barge-Thompson, 136 Ellis St., Atlanta.

Ia., Sioux City—MEDICAL ARTS—Syndicate Forming, c/o K. E. Westerland, archt., Badgerton Bldg., 13 story, basement, 2 story tower, 150 x 150 ft., rein.-con., brick, stone, 6th and Douglas Sts., to Guarantee Constr. Co., 3200 Summit St. Est. $1,500,000.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Burlingame — BOTTLING PLANT — Owner, c/o W. H. Toepke, archt., 2 story, rein.-con. bottling plant. $50,000. Construction postponed indefinitely. Noted Jan. 30.

Calif., Los Angeles—FACTORY—Rheem Mfg. Co., 4535 Horton St., Emeryville, plans by Meyer & Holler, Wright & Callender Bldg., 1 story, 210 x 400 ft., concrete, brick, steel, incl. 12 ft. loading platform. Firestone Blvd. and Rheem Ave. $100,000.

Conn., New Britain—FACTORY—Vulcan Iron Wks., 63 John St., rejected bids 1 story, 70 x 175 ft., brick, steel addition. $50,000. M. J. Unkelbach, 52 West Main St., archt. Will revise plans and readvertise. Noted Oct. 9.

Mass., Malden (br. Boston)—MANUFACTURING — E. J. Lamothe Co., 25 Chestnut St., Somerville, revised plans by Miller & Levi, 46 Cornhill, Boston, 1 story, 100 x 138 ft., brick, concrete, steel, plain found., Willis Ave. and Green St. $50,000. Former bids rejected. Noted Feb. 20.

N. J., Old Bridge — YEAST PLANT — Anheuser Busch, Inc., 721 Pestalozzi St., St. Louis, Mo., plans by Stone & Webster, 120 Bway., New York, 4 story, basement, 100 x 110 ft., brick, steel. $150,000 or more.

N. J., Paterson—DYE HOUSE—Radiance Piece Dye Wks., Inc., 373 North 11th St., Prospect Park soon lets general contract 1 story, basement, brick, steel, East 25th St. $40,000. E. R. Coe, 136 Washington St., Paterson, archt. Noted Oct. 30.

N. Y., Albany—LABORATORY—Div. Laboratories & Research, State Office Bldg., altering and extending main laboratory building. To exceed $40,000.

N. Y., Napanoch—INDUSTRIAL—Dpt. Correction, Albany, soon takes bids general contract storehouse and industrial shop. State Institute for Defective Delinquents. Noted Oct. 2.

N. Y., New York—LAUNDRY, etc.—Missionary Sisters of Sacred Heart, 226 East 20th St., plans by R. Meier, 226 East 20th St., 83 x 89 ft. laundry and dispensary, 227 East 19th St. $45,000.

O., Bowdil—FACTORY—Bowdil Co., 1 story, 24 x 200 ft. heat treating building for mine machinery and tool factory, steel fireproof. $40,000. Private plans.

O., Canton — FACTORY — United Eng. & Fdry. Co., 1400 Grace Ave. N. E., factory, Grace Ave. near 14th St. N. E. $100,000 or more. Private plans.

Tex., Brownsville — POTATO CANNING PLANT—Southern Potato Products Co., c/o G. C. Richardson, Brownsville, soon lets contract 1 story, brick, rein.-con. Private plans. Interested dealers or contractors communicate with owner at once.

Ont., Hamilton—COMPRESSOR PLANT, etc. — Manufacturers Natural Gas Co. Ltd., gas compressor plant, purification plant, 1 million ft. gas holder, 10 in. mains in Burlington, Sherman and Barton Sts. $1,000,000.

Ont., Hamilton—PLANT—Steel Company of Canada, H. H. Champ, genl. mgr., plant additions, equipment. $1,500,000.

Ont., Waterloo — FACTORY — E. O. Weber Furniture Co., Willow St., rebuilding 4 story furniture factory, recently destroyed by fire. $150,000 loss.

BIDS ASKED

N. J., Jersey City—ICE PLANT—Mongiello Bros., 625 Communipaw Ave., bids about Dec. 1, general contract 1 story, basement, 100 x 100 ft., brick, steel. $50,000. C. H. Ziegler, 26 Journal Sq., archt. Noted Oct. 16.

Tex., Texarkana — BAKERY — Butter-Nut Bread Co., 10th St. and State Line Ave., taking bids 2 story, 85 x 140 ft. bread bakery plant, brick, rein.-con. Est. $85,000, incl. equipment. Witt, Siebert & Halsey, 1st Natl. Bank Bldg., archts.

CONTRACTS AWARDED

Calif., Los Angeles — FACTORY — Domestic Mfg. Co., 2 story, 196 x 230 ft., concrete, stucco, brick, steel, 8800 Venice Blvd., to Hamm, Grant & Bruner, Inc., 607 Ferguson Bldg., $72,000.

Calif., San Francisco — FACTORY — Seattle Chain & Mfg. Co., 6921 East Marginal Way, factory to Austin Co., Russ Bldg. Est. $50,000.

Ill., Chicago — MANUFACTURING — Star Nipple Pipe Co., manufacturing building, to Austin Co., 510 North Dearborn St. Est. $50,000.

Ill., Clearing—VACUUM CLEANING PLANT —Clements Mfg. Co., 601 Fulton St., W. J. Clements, vice pres., plant, 21,00 sq.ft. floor space, 66th Pl. and Narragansett Ave., to Foltz & Co., archts. and contractors, 510 North Dearborn St., Chicago.

Ill., Oak Park—CANDY FACTORY—Mars, Inc., candy factory (well house and water softener), to Austin Co., 510 North Dearborn St., Chicago. Est. $50,000.

Mo., Jefferson—POULTRY SHIPPING and PACKING — Capital Poultry Farm, poultry shipping and packing plant, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $50,000.

N. J., Union City — DAIRY PLANT — Consumers Dairy Co., 400 45th St., Union City, general contract altering and constructing 2 story, basement, 28 x 155 ft., brick, steel addition, to Limouze Bros., Inc., 111 8th St., West New York. Est. $45,000. Noted Oct. 9.

N. Y., New York—BAKERY—Koenig Leiser Co., 391 East 149th St., 1 story, 100 x 100 ft. bakery and stores, to York Building Co., 151 West 42nd St. Est. exceeds $40,000. Noted Oct. 23.

O., Cleveland—FACTORY—Cleveland Lithograph Co., C. Morgan, pres., East 17th St. and Payne Ave., 1 story, 55 x 100 ft., brick, steel, to Albert M. Higley Co., Plymouth Bldg. Est. $40,000. Noted Oct. 30.

O., Cleveland — FACTORY, etc. — Powerlite Switchboard Co., J. F. Jirka, secy.-treas., 4149 East 71st St., 1 and 2 story, 50 x 122 ft., brick, steel factory, office, to H. K. Ferguson Co., Hanna Bldg. Est. $50,000. Noted Oct. 23.

O., Cleveland — REFLECTOR FACTORY — Roberts Realty Co., M. Siegel, 1942 Woodward Ave., 1 story, 47 x 108 ft., brick, steel, plant, to L. Fishmas, 3413 East 142nd St. Est. $40,000. Noted Oct. 16.

Pa., St. Marys—CARBON ELECTRIC PLANT —Spear Carbon Co., D. Miller, genl. mgr., 1 story, 82 x 119 ft. corrugated siding, steel frame, incl. 3 ton crane, to Rogers Structural Steel Co., Corry. Est. $40,000. Noted Oct. 30.

R. I., Saylesville—PLANTS—Sales Finishing Plants, Inc., c/o Lockwood Greene Engineers, Inc., engrs., 24 Federal St., Boston, Mass., 2 and 4 story, 76 x 226 ft., brick, steel, concrete additions, 2 story, 66 x 70 ft. and 2 story, 36 x 42 ft. connecting building to provide for singeing, bleaching, grey room, bale and finished goods, storage, locker rooms, service facilities, and necessary elevators, to Temple & Crane, 80 Federal St., Boston, Mass. Noted Oct. 16.

GARAGES

PROPOSED WORK

Calif., San Francisco — Magginni Co., 123 Jackson St., 1 story, basement, rein.-con. auto sales and service plant, Bway. and Battery. Project indefinitely postponed. L. H. Nishkian, 525 Market St., archt.

N. Y., Brooklyn — One Thousand Four Hundred Eight Pitkin Corp., A. W. Norek, pres., 66 Court St., sketches by H. J. Nurick, 44 Court St., 4 story service garage, store, Pitkin and Eastern Parkways. To exceed $75,000.

O., Cincinnati—H. J. Berning, 1124 West 8th St., plans by J. J. Brown, Provident Bank Bldg., 3 story, basement, rein.-con., brick garage, plain found., Central Parkway. $150,000.

Tenn., Jackson—Smith Motor Coach Co., F. Smith, pres., 144 North Front St., plans by Jones & Furbringer, Porter Bldg., maintenance garage, near Square. $50,000; remodeling passenger terminals, $10,000.

BIDS ASKED

Mass., Lawrence—Morehouse Baking Co., 9 Mill St., taking bids 1 story, 70 x 170 ft., brick, rein.-con., steel garage, concrete found., Jackson and Methuen Sts. $50,000. Ashton, Huntress & Alter, 477 Essex St., archts.

N. Y., New York—See "Contracts Awarded."

N. Y., New York—A. J. C. Corp., 704 East 133rd St., taking bids separate contracts 2 story, 90 x 245 ft., brick garage and auto laundry, Barry St. and Burnett Pl. $250,000. P. J. Murray, 14 West 45th St., archt. Noted Oct. 23.

R. I., Providence—E. G. Page, 225 Fountain St., taking bids 2 story, 75 x 155 ft., brick, concrete, steel, super service station, plain found., Fountain St. $75,000. F. Chiaverini, 32 Broadway, archt. Noted Oct. 30.

CONTRACTS AWARDED

N. Y., New York—Harrod Holding Corp., S. Kusnetz, pres., 1101 Manor Ave., 2 story service garage, separate contracts. $70,000. **Maturity indefinite.** J. Bloich, 4756 3rd Ave., archt. Noted Oct. 23.

Pa., Union City—Emblem Oil Co., K. W. Van Tassel, treas. and in charge, 2 story, 26 x 41 ft., brick, cinder block, stucco service station, bus depot, office, Main St. and Curry Rd., to A. F. Shreve, Main St. Est. $40,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

N. Y., Brooklyn—SHOP, etc.—H. E. Mitler, contractor, 505 5th Ave., New York, soon lets other sub-contracts 153 x 256 ft. shop, garage, for R. H. Macy Co., 34th St. and Bway. Total est. $200,000. Steel awarded, to A. E. Norton, 56 West 45th St., New York. Noted Sept. 18 under "Contracts Awarded."

BIDS ASKED

Pa., Phila.—MACHINE and PLATE SHOP—Nov. 7, by Philadelphia Gas Wks. Co., Broad and Arch Sts., 1 story, 48 x 158 ft., brick, steel, plain found., Balfour St. and Castor Rd. Private plans.

Tenn., Memphis — MACHINE SHOP and GARAGE—Nov. 10, at office Shelby County Institutions Comn., machine shop, garage on premises Shelby County Penal Farm. Hanker & Cairns, 600 Court Square Bldg., archts.

CONTRACTS AWARDED

Mass., Springfield — SERVICE — City, Street Dpt., City Hall, 2 story, basement, brick, steel service and shop building, to E. J. Pinney, Inc., 220 Dwight St., $121,226. Noted Oct. 30.

Wis., Waukesha — FOUNDRY — Spring City Fdry. Co., 1 story, 100 x 100 ft., brick, steel, concrete addition, to W. Tubesing Co., 708 Oakland Ave., Milwaukee; structural steel, to A. C. Woods, Rockford, Ill., est. $75,000.

POWER PLANTS

PROPOSED WORK

N. Y., Port Ivory (mail Staten Island)—Procter & Gamble Co., 17 Battery Pl., New York, soon lets general contract 1 story, basement, 30 x 70 ft. boiler house addition. $40,000. Private plans.

S. C., Aiken—Burns & McDonnell Eng. Co., engrs., 400 Interstate Bldg., Kansas City, Mo., making report improving power and light plant, for City.

BIDS ASKED

Mich., Detroit—Nov. 11, by D. C. Grobbel, acting secy., 735 Randolph St., furnishing, installing fuel oil burning apparatus in steam heating boiler at Auxiliary Low Lift Plant, at Water Works Park, for Dpt. Water Supply. G. H. Fenkell, genl. mgr.

WAREHOUSES

PROPOSED WORK

Mass., Brockton—Taunton Lumber Co., 242 North Montello St., sketches by R. P. Jackson, 106 Main St., brick warehouse, North Montello St. Est. $50,000. Noted Aug. 7.

N. Y., Albany—Albany Cooperage Co., 100 Arch St., bids in November, 2 story, 85 x 110 ft., brick, steel warehouse, plain found., Dungan Ave.

N .Y., New York—One Hundred Eleven West End Corp., c/o J. A. Delehanty, 115 Bway., or DePace & Juster, archts., 151 West 46th St., soon lets general contract warehouse, West End Ave., 64th and 65th Sts. $1,500,000. Noted Oct. 23.

BIDS ASKED

Mass., South Boston (sta. Boston) — Old Colony Ave. Trust, C. H. Hodge, trustee, 68 Main St., Watertown, taking bids 1 story, brick, concrete, steel, warehouse, office and salesroom, concrete found., 20,000 sq.ft. floor space, 328 Dorchester Ave. $75,000 or more; heating, plumbing, electrical work, $25,000 or more. Private plans.

N. Y., Harrison — I. Hopper & Sons, contractors, 6 East 45th St., New York, taking bids on lath, plastering, painting ornamental iron work for 2 story, basement, 110 x 200 ft. warehouse, showroom for Beherer Co., c/o J. E. Nitchie, archt., World Bldg., New York. Steel awarded, to Kalman Steel Co., 110 East 42nd St., New York. Noted Oct. 2.

N. Y., Long Island City — Nov. 17, by Voorhees, Gmelin & Walker, archts., 101 Park Ave., New York, warehouse, shop, Dutch Kills Basin and 47th Ave., for Crane Co., 836 South Michigan Ave., Chicago, Ill. Est. $350,000. Noted Oct. 30.

N. Y., Yonkers — John Wanamaker, Bway. and 9th St., bids about Nov. 12, general contract distributing warehouse depot, Central Parkway. To exceed $40,000.

CONTRACTS AWARDED

N. Y., New York—Pasquale Santini, Inc., 10 story addition to storage and warehouse, to Turner Constr. Co., Graybar Bldg., New York. Est. $150,000. Noted Oct. 23.

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